CANAL AND RESERVOIR APPLIANCES

ALTGELD HALL STACKS

"HYDRODUCT"

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This Loose-Leaf Catalogue

will be augmented from time to time by the publication of additional pages—some descriptive of appliances, others giving useful data.

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The Hinman Hydraulic Mfg. Co.
714-715 Ideal Building
Denver, Colo., U. S. A.

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CATALOGUE NUMBER 12-A

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HEAD GATES GATE LIFTS

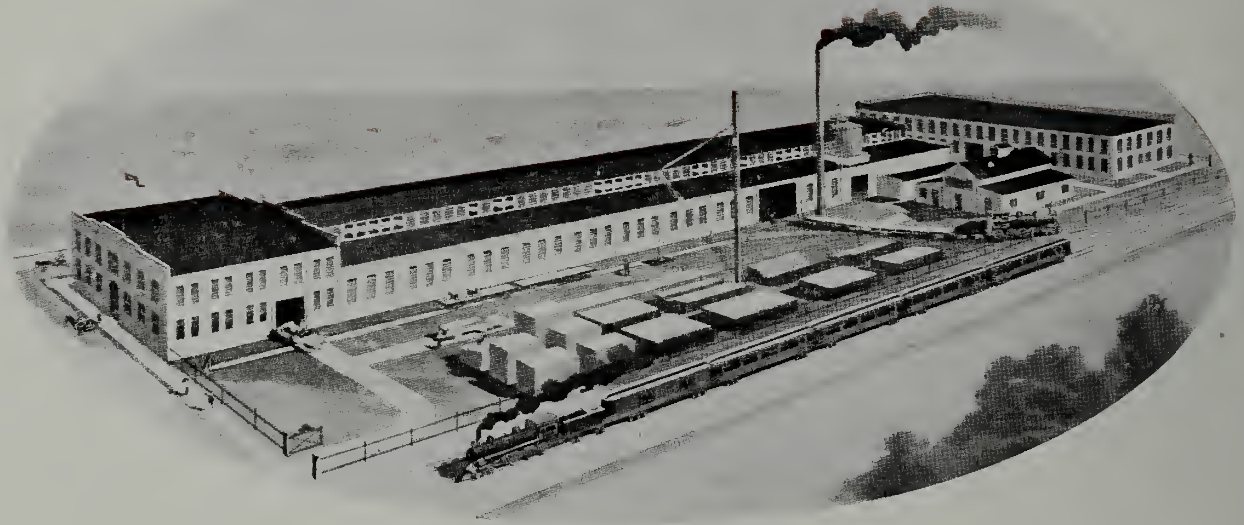
"HYDRODUCT"

THE ULTIMATE METAL FLUME

STEEL, CAST IRON AND VITRIFIED PIPE
"NATIONAL LOCK JOINT" CAST IRON CULVERT PIPE

H.H.M.CO.

THE HINMAN HYDRAULIC MANUFACTURING CO.
DENVER, COLORADO, U. S. A.



WORKS
COLFAX AVENUE AND CHAMPA STREET
DENVER

GENERAL OFFICES
714-715 IDEAL BUILDING
DENVER

INTRODUCTORY

EFFICIENCY in operation and simplicity in design are the foremost requisites for Canal and Reservoir Appliances. With these points in mind, we present the apparatus described and illustrated in the following pages.

Our shops are equipped to manufacture every kind of appliance for the control and transportation of water, and behind this equipment is an organization of experience and ability. Every transaction has as its basis: Quality, Service and a Square Deal.

It is not our intention to attempt to compete in price with Cheap and Inferior Goods that are being placed on the market. For the quality of material and workmanship necessary to produce First-Class Goods, surpassed by none for durability, our prices are as low as is consistent. As far as possible, we give prices for appliances shown in this catalogue, but as many of our products are made for different conditions of operation, it will be mutually advantageous for prices to be quoted upon receipt of the conditions of operation requested for the various appliances.

Our buildings are practically new, our machinery up to date, and the location of our shops unexcelled. With tracks entering our yards, and also directly into our buildings, we are able to make shipments of any size directly over any of the twelve railroads entering Denver.

The following pages present, only in a general way, the appliances we manufacture. If you do not find exactly what is required, we would appreciate the favor if you will place your specifications before us.

WE HAVE IT—WILL MAKE IT—OR IT'S IMPRACTICABLE

Price Is Forgotten—Quality Remains

The Hinman Hydraulic Manufacturing Company

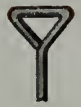


Fig. 1-A

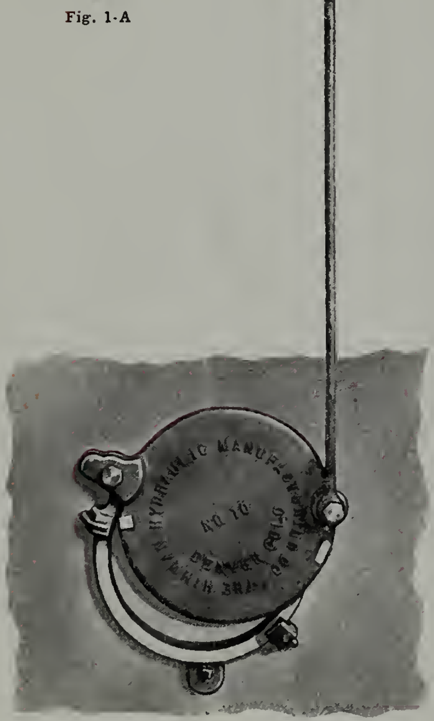


Fig. 1

Shear Gates are the simplest form of water-tight gates manufactured. They have the least number of moving parts and there is nothing to get out of order. In our design (Fig. 1) are embodied certain improvements, making it the best Shear Gate made.

Where durability, quick operation and water-tightness are the requisites, there is nothing more satisfactory.

There are but five parts in the construction; a frame, a disc to close the opening, two bolts and a handle. The frame and disc are of cast iron with contact surfaces carefully machined so that the gate is absolutely water-tight. The frame is equipped with two wedges opposite each other, which receive the disc and force it tight against the machined surface of the frame. The hinge of the disc has a stop lug so that the gate cannot be opened beyond the point giving a clear flow orifice.

Handles for operating are always furnished 3 feet long unless otherwise specified. They are made in two types, one as shown in Fig. 1, which is supplied when a steel angle post is used with the gate. The end of the handle is bent and provided with a hole to receive a padlock after the end of the handle has been placed in the desired hole. The other type is shown in Fig. 1-A and is supplied when a wood post is used in which spikes are driven and the handle hung on the proper spike to give any desired opening.

Shear Gates can be attached to any kind of pipe. The cheapest and best method is to butt the pipe against the short spigot on the gate frame, put the anchor bolts, which we furnish with each gate, in their proper position and deposit concrete in the form best adapted to the setting. This setting is, in most localities, simply a small head-wall which keeps the water from washing the gate out of the ditch bank.

This is the best and cheapest ditch gate on the market. It is durable, easily operated and the cheapest and easiest gate to mount in the ditch bank ready for operation. It can be used for direct pressures up to 15 ft. head.

LIST PRICES

Diameter of Opening in Inches	Price With 3 Ft. Handle	Longer Handles Per Ft.
6	$ 7.70	$ .20
8	9.00	.20
10	12.00	.20
12	14.00	.20
15	16.80	.30
16	18.20	.30
18	22.00	.30
20	27.00	.30
21	30.00	.30

Write for Discount Sheet

When Ordering, State:

Diameter of opening.
Length of Handle.
Type of Handle.

SHEAR GATES

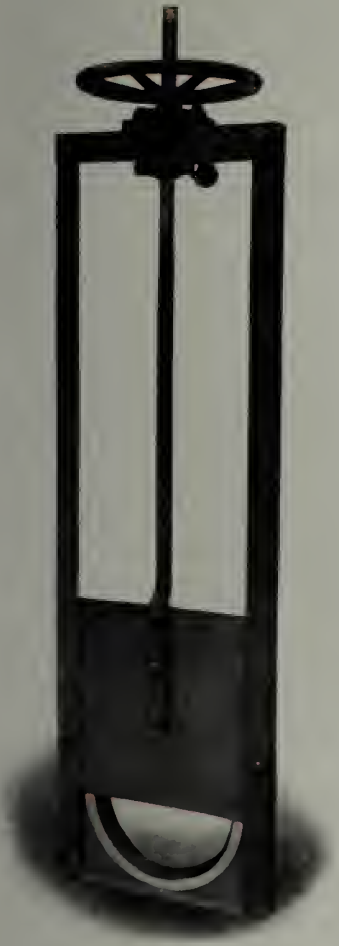


Fig. 2
Vertical Type

The Gates shown by Fig. 2 and Fig. 3 fill the demand for a Standard Gate for controlling a lateral taken from a larger canal. The wide range of sizes and the fact that the frames and stems can be made any length make these gates adaptable to all conditions.

CONSTRUCTION

Flow Orifice—Cast iron rectangular head plate with circular opening. With or without spigot extending from back.

Slide—Sheet steel fitting against raised ring on head plate.

Stem—Round steel, flattened and riveted to slide. Thread is Acme standard cut with accurate dies in a Turret Lathe—4 per inch single or 2 per inch double—the latter being equally as strong as the former and giving twice the speed in operation.

Frame—Steel angles bolted to casting at bottom and riveted to Crosshead—also steel angle—at top; forming rigid all-steel frame supporting Hand Wheel.

Stem Guides—For long frames, Stem Guides are provided, made from steel angles riveted at each end to sides of frame with hole in center through which stem slides.

Hand Wheel—Cast iron. Hub tapped to fit screw on stem. Held in position on Crosshead by cast iron keeper so that power afforded by wheel may be applied for raising or lowering gate. Spokes are shape of vertical Ogee, to throw rim of wheel above Crosshead, giving large clearance space for hands of operator.

Type—Vertical or 60° Sloping Face. Latter type preferred in many cases because it brings Hand Wheel near top of ditch bank and no plank walk is necessary to reach Hand Wheel.

Locking Device—Used on either type and puts gate in absolute control of person holding key. Fully described on page 9, Fig. 8.

Used With—Vitrified or Cast Iron pipe with spigot extending into bell. Steel Pipe bolted to spigot. Can also be used with concrete pipe or bolted directly to concrete headwall with or without spigot.

LIST PRICES

Diameter of Opening	Vertical Type Fig. 2	Weight Lbs.	Sloping Face Type Fig. 3	Weight Lbs.	Additional Height of Frame Price Per Foot
6″	$21.40	95	$28.00	125	$1.35
8″	22.50	100	30.40	135	1.35
10″	24.75	110	32.65	145	1.50
12″	26.25	125	34.65	165	1.50
15″	31.50	150	43.05	205	1.50
18″	33.30	185	45.00	250	1.80
21″	40.50	225	54.00	300	1.80
24″	45.40	275	60.20	365	2.10
27″	55.30	335	74.25	450	2.40
30″	60.00	400	81.00	540	2.70

WRITE FOR DISCOUNT SHEET

Prices are f. o. b. Denver for frame and stem 6 ft. or less in height.

Vertical Type made with SQUARE OPENING at the same prices and with RECTANGULAR OPENING at special prices depending on size.

When Ordering, Give:

Diameter of opening and height of frame desired.

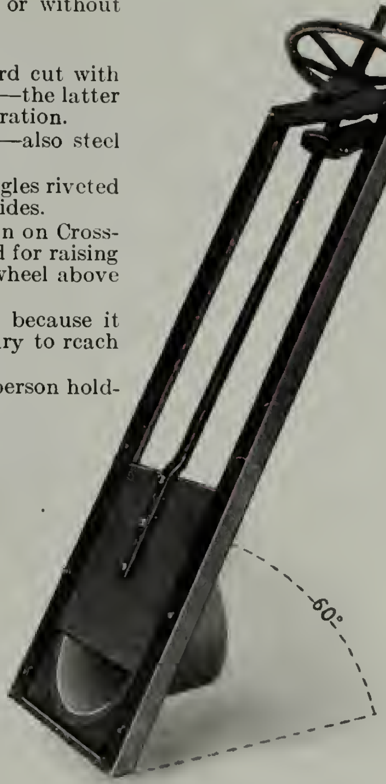


Fig. 3
60° Sloping Face Type

LATERAL GATES

VERTICAL AND 60° SLOPING FACE

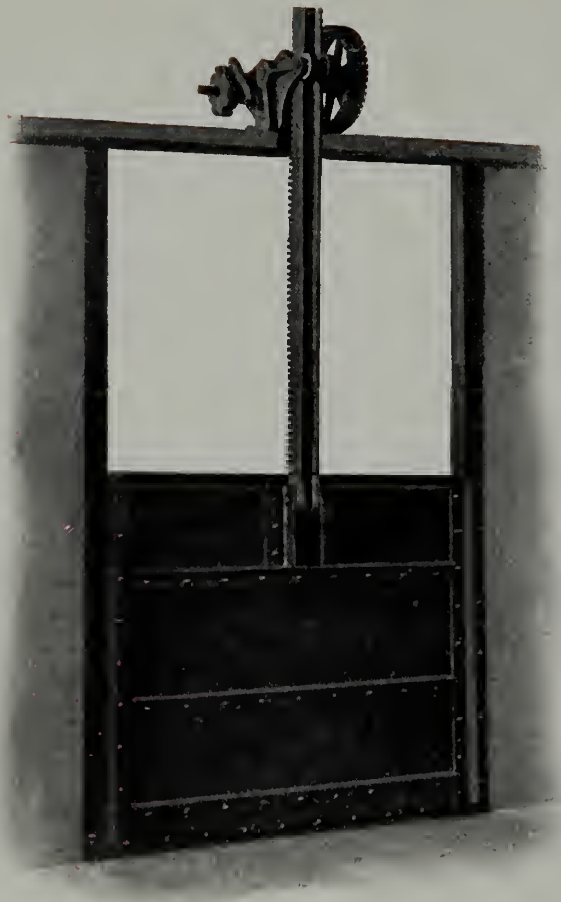


Fig. 4

For laterals requiring more water than can be obtained by use of the largest gates shown by Fig. 2 or Fig. 3, this gate (Fig. 4) should be used. With the exception of the Lift, it is made entirely of steel. The frame is made from steel angles riveted at the corners and extending above the opening to form guides for the travel of the gate. The slide is made from sheet steel, ribbed according to the pressure of water against the gate. The cut shows the gate with opening above, forming spillway; or for use where it is known that the water will never be high enough in the canal to overflow. In these cases the Lift is supported by a steel channel resting on the concrete wall on either side. This gate is often made with steel breast above the opening or for setting in a concrete wall so that the space above the gate is closed by the concrete.

While the cut shows the gate equipped with our Geared Rack and Pinion Lift, it can be operated with a Screw Lift with or without pedestal.

If there is a possibility of sand being deposited against the face of the gate, or if a smooth face gate is desired, the form of construction shown on page 16, Fig. 16, will be more suitable.

The uses of this gate are many—it can feed a large lateral, it can form a spillway, be used as a Sand Gate or as a Division Gate where the canal is divided. It is also used in numbers at Bifurcation Works on large canals where the head walls are of concrete or of steel.

LIST PRICES

Size of Opening in Feet Width x Height	Price Without Lift	Approximate Shipping Weight
3 x 3	$ 47.50	395
3 x 4	54.00	450
4 x 3	55.20	460
4 x 4	66.00	550
4 x 5	84.00	700
5 x 4	87.00	725
5 x 5	108.00	900
5 x 6	123.00	1025
5 x 7	138.00	1150
5 x 8	156.00	1300

WRITE FOR DISCOUNT SHEET

Prices are f. o. b. Denver and do not include Lift.

For prices of Lifts see pages 18, 19, 20 and 22. For sizes other than above write for special prices. Gates of this type can be made in any size.

When Ordering, Give:

Width and height of opening.

Distance from bottom of opening to base of Lift or to top of wall.

Type of Lift desired and Fig. number.

LARGE LATERAL OR DIVISION GATE

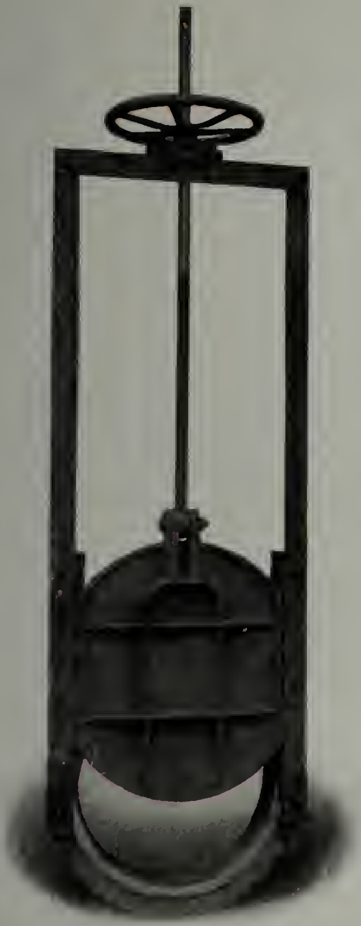


Fig. 5

Where it is necessary to have a gate absolutely water-tight, for canals or small reservoirs, our Light Pressure Gate should be used. Fig. 5 represents the acme in design and workmanship for a self-contained gate to meet these requirements.

It is mostly used for **small reservoirs** where a slight leakage means wasted water, and for this purpose it will easily pay for itself in a single season in the amount of water saved.

These gates are designed for a depth of water of from 20 to 25 feet, and are strictly light pressure gates. The thickness of metal is not slighted for these depths of water, but, on the other hand, it is not excessive, so that you do not pay for a quantity of cast iron that will never be called upon to do any work. The thickness of the different parts is carefully determined with a reasonable margin of safety, and when a heavier gate is required we refer you to our Standard Sluice Gates.

Any kind of pipe may be used with these gates—vitrified, cast iron, cement, wood stave or steel, either slip joint or flanged. Fig. 6 shows the gate equipped with flange, faced and drilled, for attaching to riveted steel pipe. They can also be supplied without spigot or flange for bolting to face of concrete.

We also make these gates with **square and rectangular openings,** as shown on page 8, Fig. 7. For detailed construction of both types see page 8.

LIST PRICES—Circular Openings

Diameter of Opening in Inches	Price	Additional Height of Frame Price Per Foot
6	$ 45.60	$ 2.00
8	50.40	2.00
10	55.20	2.00
12	58.00	2.40
15	70.00	2.40
16	74.00	2.40
18	80.00	2.40
20	93.60	3.20
21	97.20	3.20
24	118.40	3.20
27	144.00	4.00
30	163.20	4.00
36	176.00	4.00
48	322.00	4.80

WRITE FOR DISCOUNT SHEET

Prices are f. o. b. Denver for frame and stem 6 ft. or less in height, except 30″, which frame is 6½ ft., 36″, which is 7 ft., and 48″, which is 9 ft.

Prices on application for gates with flanged spigots faced and drilled, Fig. 6.

When Ordering, Give:
Diameter of opening and height of frame desired.

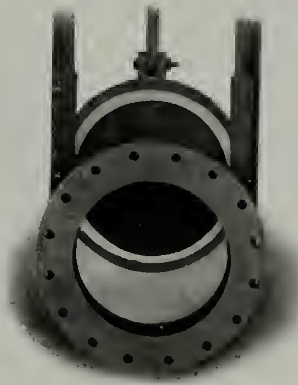


Fig. 6

CAST IRON LATERAL OR SMALL RESERVOIR GATE

LIGHT PRESSURE—CIRCULAR OPENING

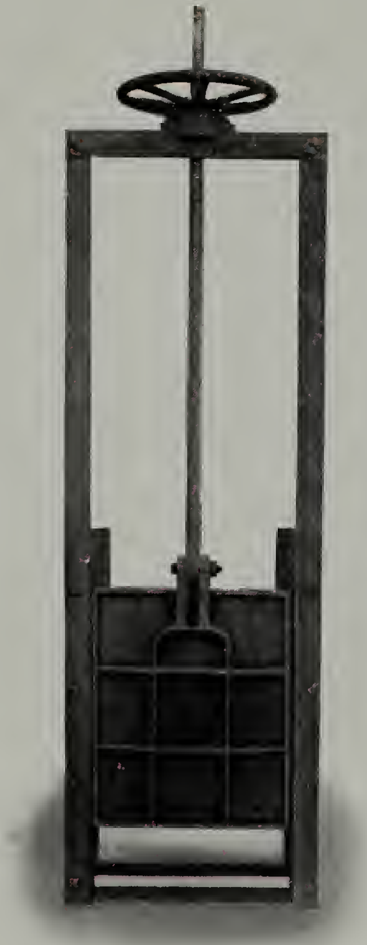


Fig. 7

Sometimes the shape of the outlet tube or conduit through the ditch bank or dam is preferred square or rectangular, and in such cases a square or rectangular gate is best adapted to control the flow of water. Fig. 7 illustrates this gate with square opening. The construction is the same as the gate shown in Fig. 5, which is generally as follows:

CONSTRUCTION

Flow Orifice—Cast iron head plate with circular, square or rectangular opening. Can be furnished with flat back, with spigot extending from head plate or with flanged spigot.

Slide—Cast iron, ribbed. Contact surfaces are slightly raised rings on both head plate and slide carefully machined, making the gate **absolutely water-tight.** Lugs to which stem is attached, form stop so that contact rings are in correct position when gate is closed.

Stem—Round steel, with eye forged in lower end to receive bolt attaching it to slide. Thread is Acme standard cut with accurate dies in a Turret Lathe—4 per inch, single or 2 per inch, double—the latter, while not as powerful, is equally as strong as the former and gives twice the speed in operation.

Frame—Steel angles bolted to casting at bottom and riveted to Crosshead (also steel angle) at top; forming rigid all-steel frame supporting Hand Wheel.

Stem Guides—Provided for long frames, made from steel angles riveted at each end to sides of frame, hole in center through which stem slides.

Hand Wheel—Cast iron. Hub tapped to fit screw on stem. Held in position on Crosshead by cast iron keeper so that power afforded by wheel may be applied for raising or lowering gate. Spokes are shape of vertical Ogee, to throw rim of wheel above Crosshead, giving large clearance space for hands of operator.

Locking Device—Used on all sizes if desired. Puts gate in control of person holding key. Fully described on page 9, Fig. 8.

Used With—Vitrified or cast iron pipe with spigot extending into bell. Steel Pipe bolted to spigot or flanged and bolted to flanged spigot on gate. (See Fig. 6.) Square and rectangular gates used with concrete tubes or conduits of same shape. Can also be bolted directly to concrete headwall, with or without spigot.

LIST PRICES

SQUARE OPENING			RECTANGULAR OPENING		
Size of Opening in Inches	Price	Additional Height of Frame Price Per Foot	Size of Opening in Inches Width x Height	Price	Additional Height of Frame Price Per Foot
6 x 6	$ 48.00	$ 2.00	12 x 8	$ 58.00	$ 2.40
8 x 8	54.00	2.00	18 x 12	84.00	2.40
10 x 10	60.00	2.00	24 x 12	104.00	3.20
12 x 12	64.00	2.40	24 x 18	120.00	3.20
16 x 16	82.80	2.40	30 x 18	150.00	4.00
20 x 20	108.00	3.20	30 x 24	166.40	4.00
24 x 24	142.80	3.20	36 x 18	152.00	4.00
30 x 30	182.40	4.00	36 x 24	176.00	4.00
36 x 36	196.00	4.00	48 x 24	208.00	4.80
48 x 48	350.00	4.80	48 x 36	280.00	4.80

WRITE FOR DISCOUNT SHEET

Prices are f. o. b. Denver for frame and stem 6 ft. or less in height, except openings 30″ high, which frames are 6½ ft.; 36″ high, which are 7 ft., and 48″ high, which are 9 ft.

When Ordering, Give:

Size of opening and height of frame desired.

CAST IRON LATERAL OR SMALL RESERVOIR GATE

LIGHT PRESSURE—SQUARE OR RECTANGULAR OPENING

A Locking Device is usually required for Lateral Gates so that Ditch Riders may have control over the water allotted to each water user. The best device of its kind for this purpose is shown in Fig. 8. It is designed to be placed at a certain position on the gate stem by the ditch rider, so as to permit the proper amount of water to pass through the gate. The irrigator can close it slightly to lessen his water supply, or he can close it entirely. He can raise it again at any time, but only to the height where the lock is stopped by the crosshead. The ditch rider can also close the gate and turn the lock tight against the crosshead, so that it cannot be operated at all.

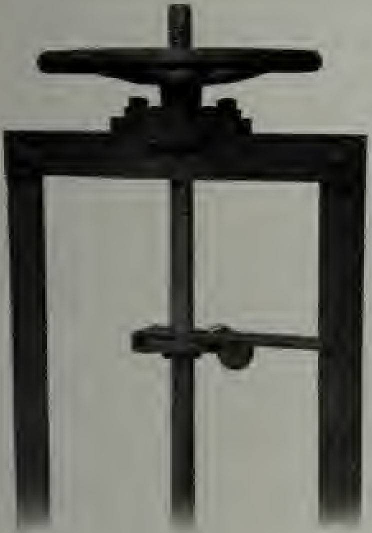


Fig. 8

CONSTRUCTION

The device consists of a cast iron nut threaded to fit the screw on the stem and is provided with six small holes in which a padlock may be placed. The arm is made of flat steel bent over the edge of the nut at one end and provided with a forked notch at the other that will slide up or down on the gate frame. There are two holes in the bar, one large enough to permit the stem to pass freely and the other large enough to take the padlock. The bar is thus held between the stem and frame so that it has no motion except in a vertical direction. When the nut is turned on the stem it carries the bar with it and when at the proper place, the nut is locked to the bar by passing the padlock through the small hole in the bar and through one of the six holes in the nut. This holds the nut from turning and the bar from any movement whatever, except as the stem moves.

This device is adjustable to 1-12 of an inch on a stem having two threads per inch and to 1-24 of an inch where there are four threads per inch. It is rigid when locked and cannot be tampered with or readjusted in the slightest degree, and the thread is not cut away or weakened by using it.

For use on gates as shown by Figs. 2, 3, 5 and 7.

LIST PRICES

For 12″ Gates and smaller, each	$ 2.00
From 12″ to 30″ Gates, each	2.80
For larger than 30″ Gates, each	3.20

WRITE FOR DISCOUNT SHEET

Padlocks not included in above prices

In the use of vitrified pipe for the outlet through the ditch bank, it is often desirable to attach the headgate to the bell end of the first section of pipe. Fig. 9 shows our method of accomplishing this. Four lugs are cast on the back of the head plate; the ends of these lugs are tapped and fitted with set screws which are adjusted to four small bearing plates curved to fit the bell of the pipe. When the pipe is placed against the back of the gate with the spigot extending into the bell of the pipe, the set screws are tightened and the pipe is thus held securely to the gate. Concrete should be deposited around the connection and should extend on each side and above and below the pipe as far as is necessary to prevent seepage. We furnish anchor bolts with each headgate so that by placing them in the concrete at this point, the pipe and gate may be held rigidly together without the use of the attachment if desired.

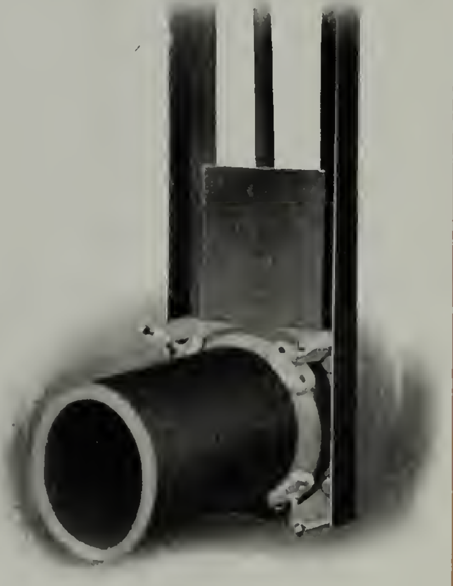


Fig. 9

LIST PRICES

For 12″ Gates and smaller, each	$ 3.00
From 12″ to 24″ Gates, each	4.00
For larger than 24″ Gates, each	5.00

WRITE FOR DISCOUNT SHEET

LOCKING DEVICE AND ATTACHMENT FOR HOLDING VITRIFIED PIPE

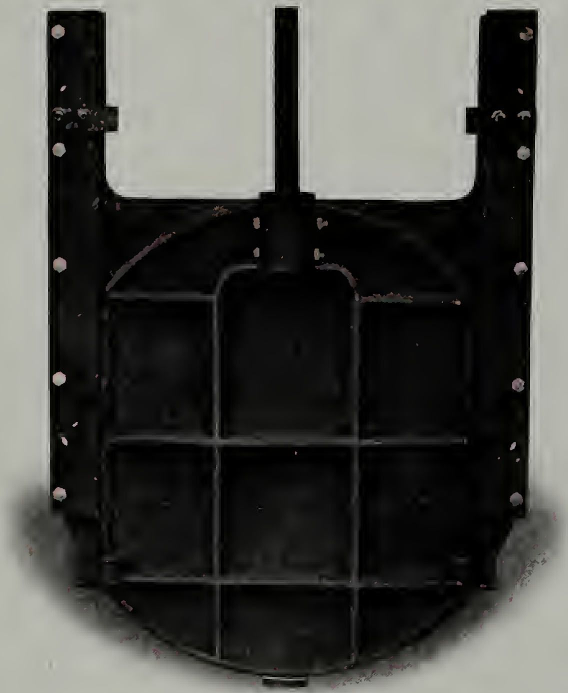


Fig. 10

Our Standard Sluice Gates are made for any water pressure with either round, square or rectangular openings. Contact surfaces can be bronze to bronze, cast iron to cast iron or bronze on the frame and cast iron on the slide. Gates can be made for direct pressure as shown in Fig. 10 and Fig. 11, or for back pressure, in which case wedges are provided for forcing the slide against the frame. Stops are placed on gates to prevent them from being raised too high, and also to hold the contact surfaces in proper position when the gate is closed so that it will be water-tight.

Circular gates can be used with vitrified or cast iron pipe, the standard spigot on the back of the gate frame extending into the bell of the pipe. Steel pipe can be bolted to the spigot, or the gate frame can be made with a flanged spigot which can be faced and drilled for standard flanges. Concrete or wood stave pipe may also be used, or the gates may be bolted directly to concrete headwalls.

We strongly recommend bronze contact surfaces on both the frame and slide. It is best for satisfactory operation in the long run, as it **will not rust.** Bronze is recommended to prevent rusting of these contact surfaces regardless of the pressure of water against the gate. Some manufacturers suggest bronze facing only for high pressures, which would appear to be for the purpose of reducing friction. This is not true, however, as bronze to bronze has a greater co-efficient of friction than cast iron to cast iron.

For General Sluice Gate Construction see opposite page.

STANDARD SIZES—CIRCULAR OPENING

Diameter—12″, 14″, 16″, 18″, 20″, 24″, 30″, 36″, 42″, 48″, 54″, 60″, 72″.

Gates are shipped complete with anchor bolts and, unless otherwise specified, will be equipped with our standard spigot extending a few inches from back of gate frame.

When Ordering or Requesting Prices, State:

Diameter of opening.
Greatest depth of water against center of gate.
Distance from center of opening to base of Lift.
Type of Lift preferred.
Kind of material desired for contact surfaces between slide and frame.
Type of connection on back of gate frame—whether for pipe or for headwall.

CIRCULAR SLUICE GATES

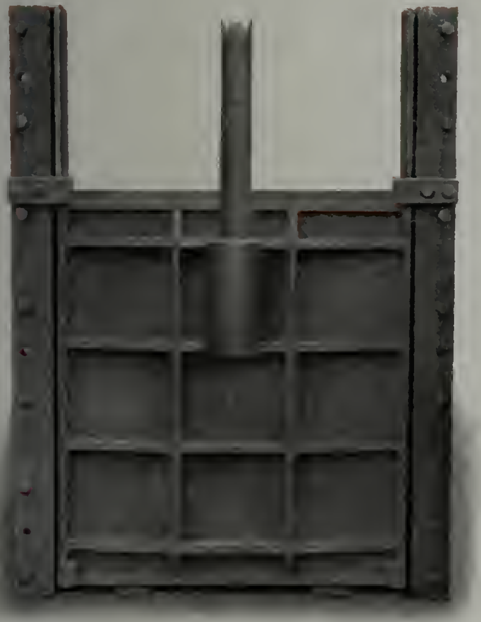


Fig. 11

The construction of square and rectangular Sluice Gates is the same as that for the circular type. The following General Construction, therefore, applies alike to either.

GENERAL CONSTRUCTION FOR STANDARD SLUICE GATES

Frame—Heavy, best gray iron casting corresponding to shape of opening. Plain or flanged spigot extending from back. Front or face forms contact surface which is carefully machined for cast iron face or to receive bronze facing. Sides of frame extend above opening, forming guides for slide when raised.

Slide—Heavy casting, ribbed for necessary working pressure. Back is machined to form contact surface matching that on frame. Upper part of ribbed side has cylinder casting to which stem is attached.

Guides—For direct pressure gates, are of flat steel bolted to frame. For back pressure gates, they can be fitted with wedges, stationary or adjustable.

Contact Surfaces—Cast Iron to Cast Iron; Bronze to Bronze or Cast Iron to Bronze. In the latter case the surface on slide is machined Cast Iron and on frame is Bronze.

Stem Connection—Bolts passing through cylinder cast on slide and through stem.

STANDARD SIZES

Square Openings	
12″ x 12″	36″ x 36″
14″ x 14″	42″ x 42″
16″ x 16″	48″ x 48″
18″ x 18″	54″ x 54″
20″ x 20″	60″ x 60″
24″ x 24″	72″ x 72″

Rectangular Openings		
18″ x 24″	36″ x 60″	48″ x 84″
18″ x 36″	36″ x 72″	60″ x 72″
24″ x 36″	42″ x 60″	60″ x 84″
24″ x 48″	42″ x 72″	60″ x 96″
30″ x 60″	48″ x 60″	72″ x 84″
36″ x 48″	48″ x 72″	72″ x 96″

Gates are shipped complete with anchor bolts and, unless otherwise specified, will be equipped with our standard spigot extending a few inches from back of gate frame.

When Ordering or Requesting Prices, State:

Width and height of opening.
Greatest depth of water against center of gate.
Distance from center of opening to base of Lift.
Type of Lift preferred.
Kind of material desired for contact surfaces between slide and frame.
Type of connection on back of gate frame—whether plain or flanged spigot.

SQUARE AND RECTANGULAR SLUICE GATES

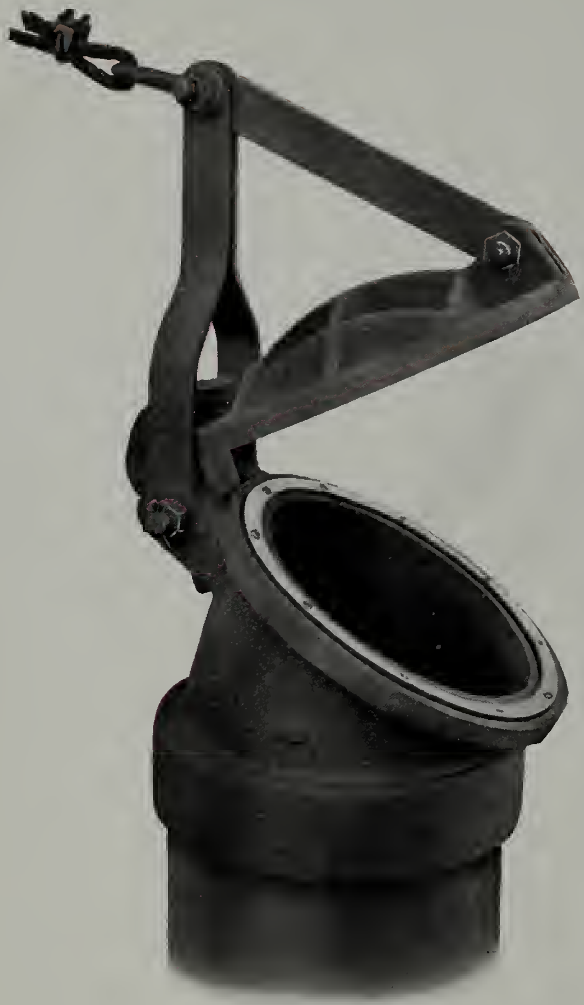


Fig. 12

Even the best of valves and sluice gates are sometimes visited by a combination of circumstances rendering them inoperative. Such circumstances need not necessarily be faulty design or poor workmanship in the gate or valve, but the result, should the gate or valve be open, would be the loss of all the water in the reservoir, regardless of the cause. This is a dire calamity in the case of water stored for irrigation purposes, and the Emergency Gate affords the opportunity for purchasing cheap insurance against this loss.

The Emergency Gate is placed at the toe of the inside slope of the dam and is attached to the inlet end of the pipe or conduit which forms the outlet to the reservoir. The gate operates on a hinge by means of a cable passing up the slope of the dam and secured at the top to a Winch, (Fig. 28, page 23), or by a special screw Lift. Except for the small sizes, some by-pass arrangement must be made, as these gates are operated against direct pressure and not frictional resistance. This is usually accomplished by carrying a smaller pipe, 4″ or 6″, through the dam so that its controlling valve will be at the point of operation of the main gates or valves. We eliminate the expense of this pipe and extra work by placing a small flap gate directly on the face of the large gate. This small flap is 6″ or 8″ in diameter and is operated by a smaller cable attached to the main cable. When the large gate is closed, water can be admitted to the pipe by pulling up the slack in the main cable, which easily opens the small flap, and the pipe is quickly filled, thus equalizing the pressure on the large gate so that it can be raised with very little power.

The frame is made to attach to vertical pipe, as shown in Fig. 12, to horizontal pipe or to concrete or masonry headwall. The contact surfaces consist of a bronze ring seated in a machined groove in the frame and a machined cast iron ring on the under side of the flap. The flap is of cast iron heavily ribbed and is hinged to the frame by a heavy cold rolled bronze pin. The operating arms are of forged steel made according to requirements of the setting of the gate.

STANDARD SIZES—CIRCULAR OPENING

Diameter—16″, 18″, 20″, 24″, 30″, 36″, 48″.

When Ordering or Requesting Prices, State:

Diameter of opening.
Greatest depth of water against center of gate.
Distance from center of opening to top of slope of dam.
How gate is to be mounted—whether connected to horizontal or vertical pipe or to headwall.

EMERGENCY OR FLAP GATE

All-steel gates for controlling the water at the intakes of canals represent the most economical form of permanent construction. Fig. 13 illustrates our new **Smooth Face Gate** for this purpose. The ribs are placed on the back so that they cannot catch sand or any material that may be carried against the gates when they are closed and interfere with raising them.

These gates can be made with openings of any size, and any number of gates can be made in a battery. The space above the openings is closed by a sheet steel breast of the required height. The frame is of structural steel securely anchored to the concrete floor and side walls, which form the only necessary masonry work.

The Lifts shown are of the Geared Rack and Pinion type (see Fig. 26 page 22), but any of the other types can be used.

STANDARD SIZES OF OPENINGS

Width x Height	Width x Height	Width x Height
3′ x 2′	4′ x 3′	5′ x 3′
3′ x 3′	4′ x 3½′	5′ x 3½′
3′ x 3½′	4′ x 4′	5′ x 4′
3′ x 4′	4′ x 4½′	5′ x 4½′
3′ x 4½′	4′ x 5′	5′ x 5′
3′ x 5′	4′ x 6′	5′ x 6′
	4′ x 7′	5′ x 7′
	4′ x 8′	5′ x 8′

When Ordering or Requesting Prices, State:

Width and height of each opening.
Number of openings.
Greatest depth of water against center of openings.
Type of Lift preferred.

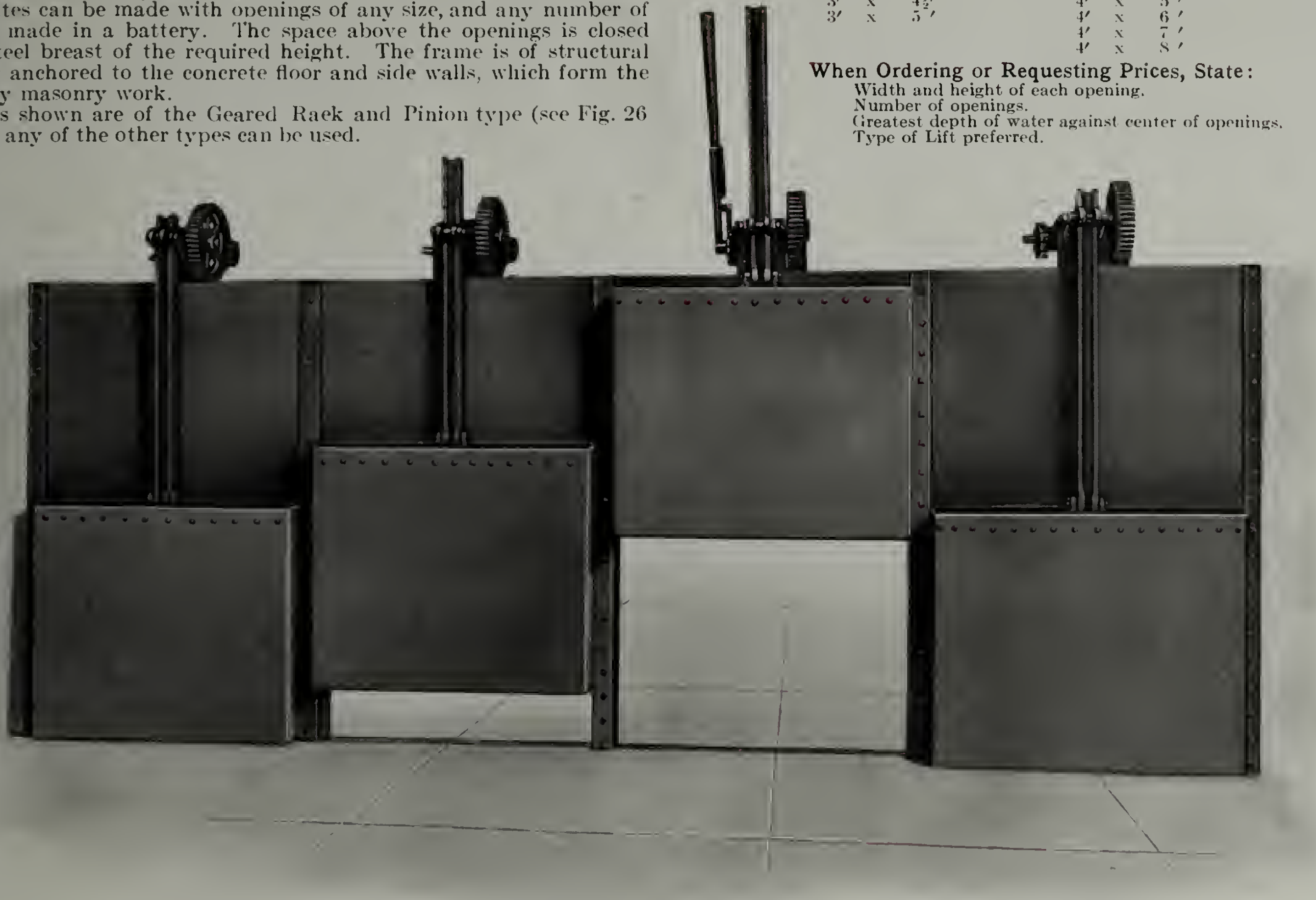


Fig. 13

STEEL INTAKE GATES

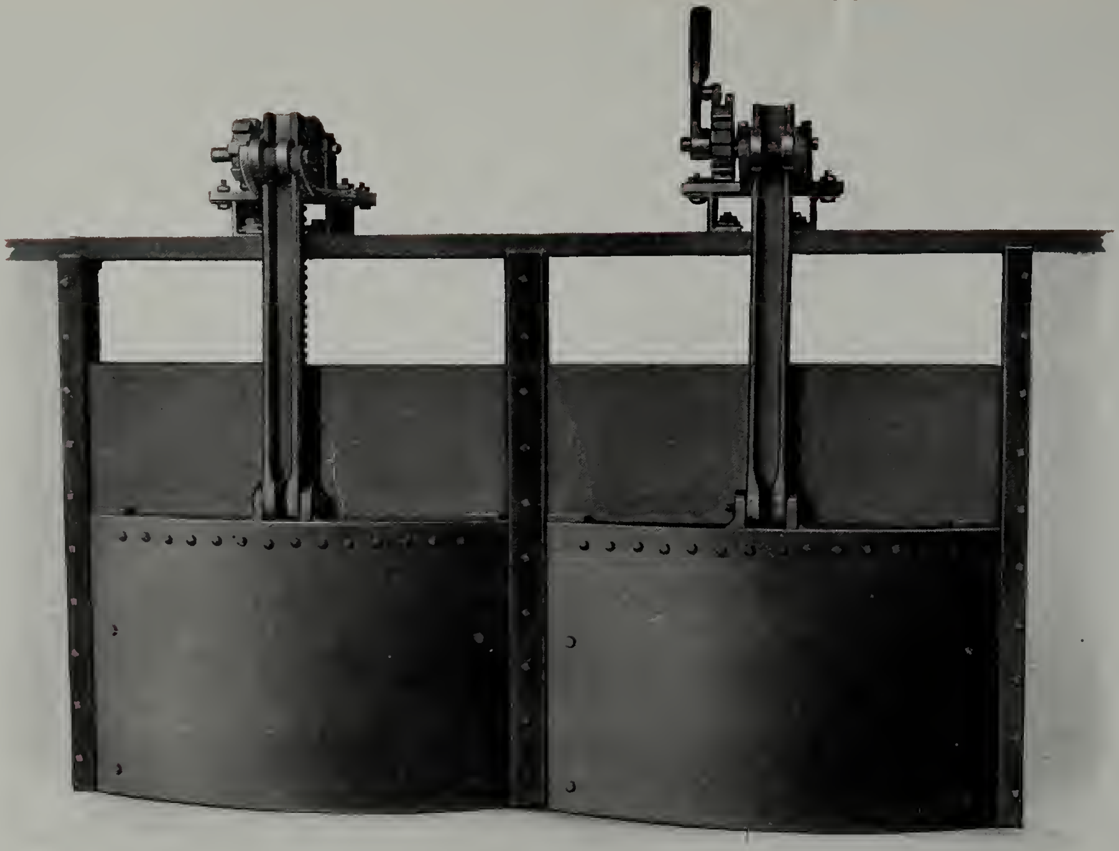


Fig. 14

Spillway Gates are of the same construction as the Intake Gates shown on the preceding page, except that the steel breast above the openings is either omitted or else made only of a certain height so that water will spill over when it reaches this height. These gates can also be used to supply a smaller canal taken from the main canal. In such cases the gates or the steel breasts are made a few inches higher than the water level in the main canal when it is flowing full.

The openings can be made any size and any number of gates can be made in a battery. The Lifts shown in Fig. 14 are the Plain Rack and Pinion type (Fig. 25, page 22) but any of the other types can be furnished.

STANDARD SIZES OF OPENINGS

Width x Height	Width x Height	Width x Height
3′ x 2′	4′ x 3′	5′ x 3′
3′ x 3′	4′ x 3½′	5′ x 3½′
3′ x 3½′	4′ x 4′	5′ x 4′
3′ x 4′	4′ x 4½′	5′ x 4½′
3′ x 4½′	4′ x 5′	5′ x 5′
3′ x 5′	4′ x 6′	5′ x 6′
	4′ x 7′	5′ x 7′
	4′ x 8′	5′ x 8′

When Ordering or Requesting Prices, State:

Width and height of openings.
Number of openings.
Depth of water from center of opening to top of spillway—for Spillway Gates.
Depth of water from center of opening to surface—for Smaller Canal Gates.
Type of Lift preferred.

STEEL SPILLWAY GATES

When it is necessary to raise the water in the canal for any purpose, or to check its flow, Butterfly or Check Gates are inserted. They are operated on a vertical axle and have a bearing against a vertical member of the frame on one side of the gate so that the pressure of water against the other side tends to revolve the gate on its axle or to open it. For this reason the gates are not entirely water-tight.

The operating device is made especially for this type of gate, and consists of a large spur gear fitted to the top of the axle. The pinion meshing with it is keyed to a shaft on top of which is placed a hand-wheel. The power is sufficient to easily operate the gates.

Any number of gates can be made in a battery and the gates can be made any size. They usually are about 6 inches higher than the highest water, and those shown in Fig. 15 are provided with a spillway between the tops of the gates and the frame supporting the operating devices.

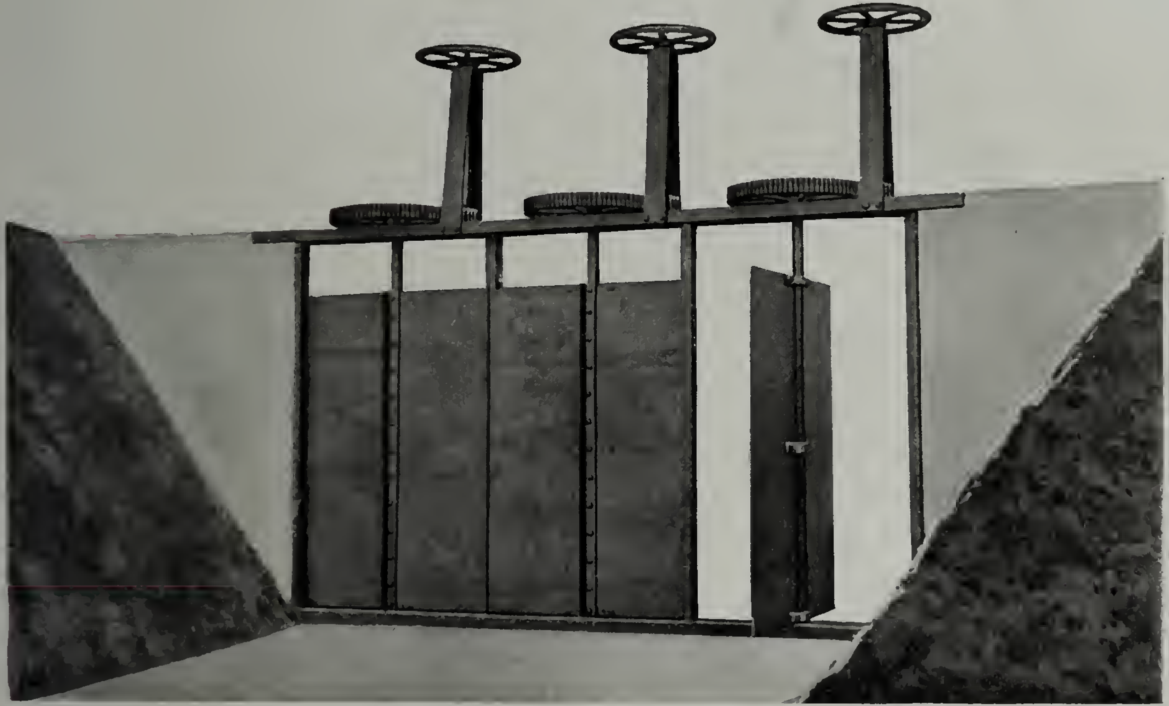


Fig. 15

STANDARD SIZES—EACH GATE

Width x Height

3′ x 5′ 4′ x 6′ 5′ x 7′

When Ordering or Requesting Prices, State:

Width and height of each opening.

Number of openings.

Greatest depth of water to be held back in canal.

Height of frame desired.

BUTTERFLY GATES

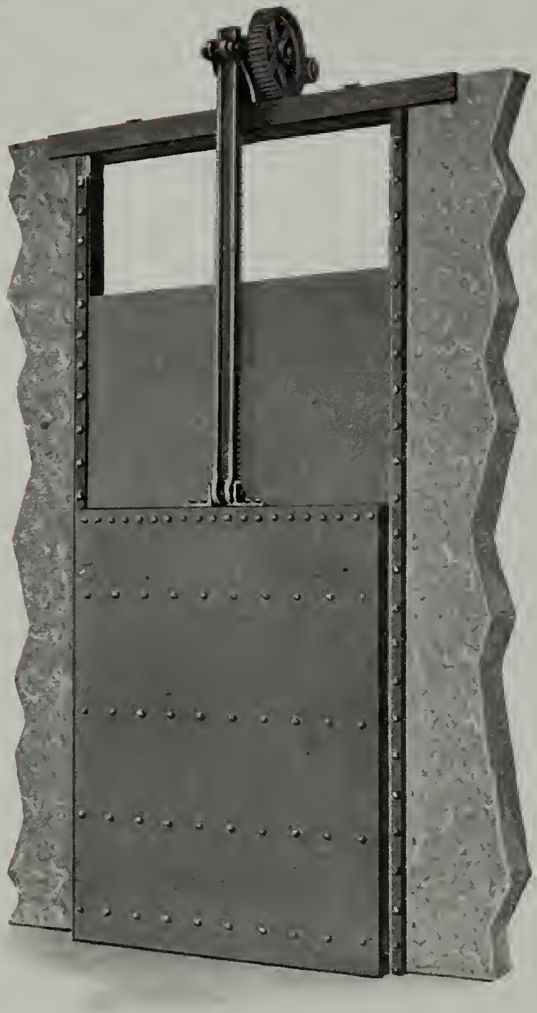


Fig. 16

In the use of Sand or Waste Gates it is very desirable that the face of the gate have a smooth surface which will present the least resistance to friction when sand is deposited against it. With the ordinary form of steel gate, the face must be ribbed so that the gate will have stiffness enough to prevent bending, thus making it easy to operate. These ribs offer great resistance to lifting and in many cases, unless the Lift is very powerful, and, of course, proportionally expensive, the gate cannot be moved. Fig. 16 shows our new gate which has a smooth steel plate forming the face. It is very stiff, which assures easy operation and permits a Lift of moderate cost to be used.

The space above the opening can be left open, can be fitted with a steel breast full height or with steel breast of any height required. The frame and guides are all of steel and are held rigidly in place by anchor bolts. Fig. 16 shows steel angles placed across the top to form support for the Lift, which is of the Geared Rack and Pinion type. Other types of Lifts can be furnished if desired.

These gates can be made with openings any size, and with frames any height. Also with or without steel breast or with steel breast any stated height.

The sizes listed are standard, and frames must always be made high enough to permit the gate to be raised full height of opening.

STANDARD SIZES OF OPENINGS

Width x Height	Width x Height	Width x Height
3′ x 2′	4′ x 3′	5′ x 3′
3′ x 3′	4′ x 3½′	5′ x 3½′
3′ x 3½′	4′ x 4′	5′ x 4′
3′ x 4′	4′ x 4½′	5′ x 4½′
3′ x 4½′	4′ x 5′	5′ x 5′
3′ x 5′	4′ x 6′	5′ x 6′
	4′ x 7′	5′ x 7′
	4′ x 8′	5′ x 8′

When Ordering or Requesting Prices, State:

Width and height of opening.
Height of frame, from bottom of opening to base of Lift.
With or without steel breast. If breast is wanted state how high above opening.
Greatest depth of water against center of gate.
Type of Lift preferred.

SAND OR WASTE GATES

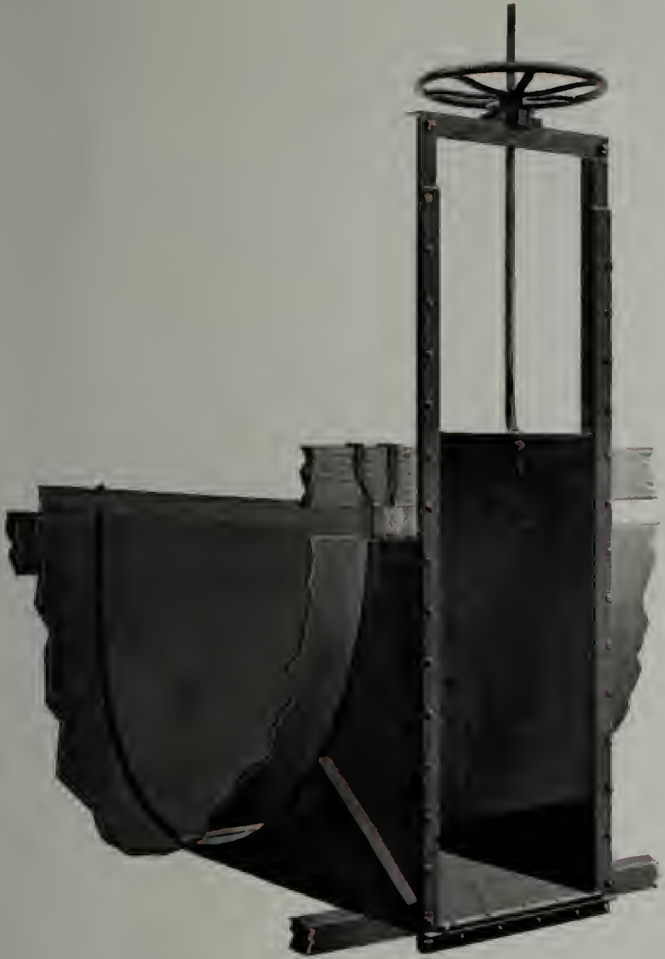


Fig. 17

With the advent of the Metal Flume came the necessity of a metal gate to be used as a spillway or for feeding a smaller flume or canal taken from the main flume. It is very often desirable when a flume crosses a stream or "draw," to make provision for emptying the water at these natural water courses, and the Flume Gate offers the safest and most economical method of providing the outlet.

The gate slides vertically in steel guides and is operated by a hand wheel supported on a steel angle frame. To this frame is riveted the sheet steel apron, ribbed with small steel angles for stiffness, and formed into a quarter circle and flanged at the edges to fit onto the semi-circular flume. The sheet steel apron can be extended beyond the gate if desired, and formed into any shape for connection to pipe flume or to lead into a chute.

The size of these gates is governed by the size of the flume with which they are used; the depth of the flume representing the height of the gate and the distance between the joints of the flume governing the over-all width of the guides which leaves the clear width of flow opening about 24 inches.

In placing these gates it is necessary to throw the side stringers which support the flume, above the top of the metal waterway, supporting the waterway by steel stirrups, as shown in Fig. 17. The weight of the gate is taken by the timber shown underneath, which is bolted to the flume substructure. Any number of gates may be placed side by side to secure the necessary amount of outlet area.

When Ordering or Requesting Prices, State:

Size of Flume for which gate is required, or give distance across top of flume.

Number of gates required.

This gate designed specially for use with our

"HYDRODUCT"

See pages 28 to 31.

FLUME GATES

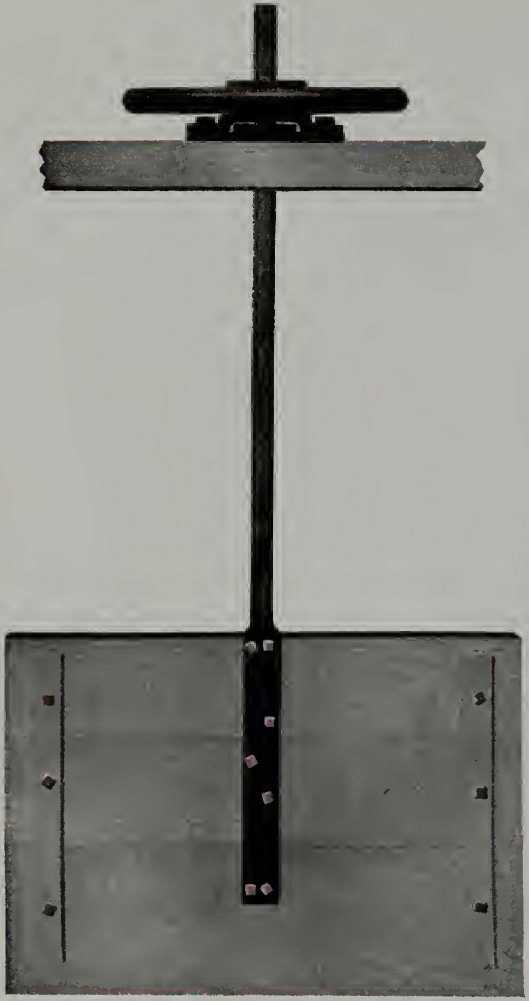


Fig. 18

LIFTS

Efficiency is undoubtedly demanded in Lifts more than in any other appliance for canals and reservoirs. Gates and Valves are useless unless they can be satisfactorily operated, which condition is dependent solely upon the Lift.

The capacity of our Lifts is scientifically computed; the loss of friction for each kind of mechanical movement being taken into consideration in determining the efficiency of the Lift as a whole. We therefore believe that for a given specified power to be exerted, we come very near to the effective power of the Lift in actual operation.

The doubtful feature in these computations is the efficiency of the screw, which has been studied both theoretically and experimentally, but the available data upon the latter are very scarce in comparison with the universal application of the screw in applied mechanics. We have endeavored to obtain as much experimental data as possible and to incorporate the results in our computations.

All our screw Lifts are equipped with bronze nuts—we do not recommend them otherwise. Shaft bearings are babbitted or bronze bushed, and all ball bearings run in case hardened steel races, not simply in grooves cut in the cast iron.

Screws for Lifts are generally made from cold rolled steel, but can be furnished from cold rolled or Tobin bronze if required. We always use Acme standard thread, lathe cut. Exhaustive tests have shown this to be the strongest of the various forms of thread.

We will be very glad to give the power of any of our Lifts upon receipt of a statement of conditions under which they are to operate.

The best screw Lift for wood gates is shown in Fig. 18. It is made either plain or ball bearing and has a bronze nut through which the screw works. The hand wheel and keeper are of cast iron and the nut bears on a heavy plate. When ball bearings are used they may be placed under the nut, which is called single ball bearing, or they may be placed both under and over the nut, which is called double ball bearing. The balls are of tool steel and run in case hardened steel races. The hand wheel can be keyed to the bronze nut or the nut can be made hexagonal and the wheel fitted so that it is removable. Unless otherwise specified, removable hand wheels will be furnished at prices stated below. If hand wheels are to be keyed to bronze nuts add $3.00 to list prices.

Stems can be made any length and are divided into three parts, viz.: Screw, neck and flat. The screw is the part on which the thread is cut; the neck is the round part between the screw and flat and the flat is the lower end flattened to attach to the wood gate.

LIST PRICES

Hand Wheel Plain Bearing		Stem*		Price Per Foot of Extra			Extra for Ball Bearing	
Diameter	Price	Diameter	Price	Screw	Neck	Flat	Single	Double
18″	$ 7.20	1¼″	$ 4.10	$ .60	$ .32	$ .42	$10.00	$20.00
18″	7.60	1½″	5.20	.80	.42	.58	10.00	20.00
24″	11.50	1¾″	7.80	1.00	.58	.64	11.00	22.00
24″	13.00	2 ″	9.80	1.20	.74	1.00	11.00	22.00
30″	19.50	2½″	19.70	2.20	1.20	1.50	12.00	24.00

WRITE FOR DISCOUNT SHEET

*Prices on these complete stems are based on 4 ft. length over all for 1¼″ and 1½″ diameters, including 3 ft. screw, 6″ neck and 18″ flat; 7 ft. length over all for 1¾″ and 2″ diameters, including 4 ft. screw, 12″ neck and 24″ flat; and 9 ft. length over all for 2½″ diameter, including 5 ft. screw, 12″ neck and 36″ flat. Extra prices of parts as per above list.

When Ordering, State:

Size of gate, greatest depth of water against center of it, distance from center of gate to top of timber supporting hand wheel, and we will determine sizes of stem and hand wheel; or, give diameter of hand wheel, diameter of stem, length of screw, length of neck, length of flat and whether plain or ball bearing.

STEM AND HAND WHEEL LIFT FOR WOOD GATES

Pedestal Lifts are made for supporting the operating mechanism at a suitable height from the floor or operating platform, so that it is within convenient reach of the operator. In our Type A Lifts, the same pedestal is used for the several different kinds of mechanism. The pedestal can be equipped with hand wheel or bevel gearing keyed to the bronze nut, and the nut may be either plain, single or double ball bearing. Hand wheels can be supplied of different diameters according to the power required. The bevel gearing shown in Fig. 20 has a ratio of 4 to 1 and is standard, but we will quote prices on application for gearing of other ratios. With geared lifts we furnish a forged steel crank 15 inches long.

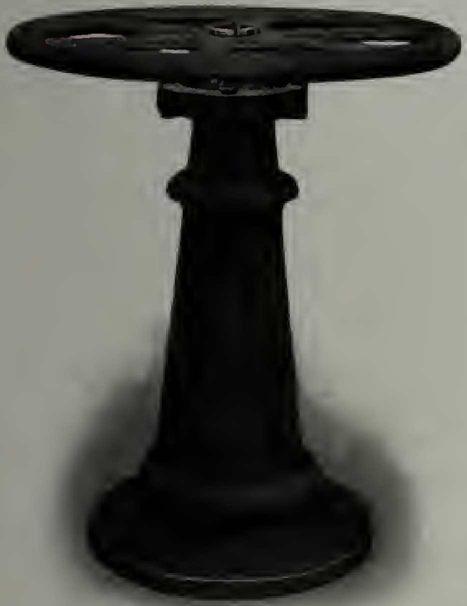


Fig. 19
Hand Wheel

LIST PRICES

Hand Wheel Type—Fig. 19

Diameter of Hand Wheel	Plain Bearing	Ball Bearing	
		Single	Double
18″	$35.00	$47.50	$60.00
20″	38.00	50.00	62.50
24″	42.00	53.80	66.30
30″	45.00	57.50	70.00

Bevel Geared Type—Fig. 20

Ratio of Gearing	Plain Bearing	Ball Bearing	
		Single	Double
2 to 1	$60.00	$72.50	$85.00
4 to 1	65.00	77.50	90.00

WRITE FOR DISCOUNT SHEET
Prices are f. o. b. Denver

When Ordering, State:

Size of gate to be operated.
Greatest depth of water against center of gate.
Distance from center of gate to base of Lift.

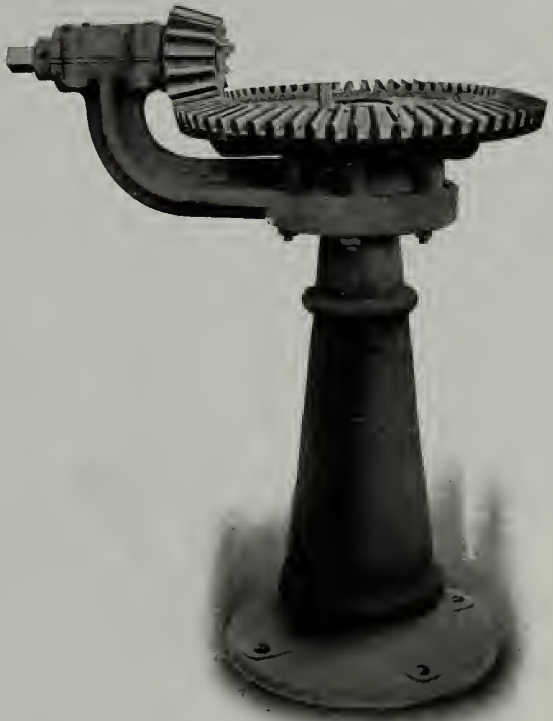


Fig. 20
Bevel Geared

PEDESTAL LIFTS—Type A

PLAIN BEARING AND SINGLE OR DOUBLE BALL BEARING, WITH BRONZE NUTS

Type B Pedestal Lifts are designed for operating large sluice gates or gates under high pressure. They are made with bevel gearing operated by a crank or pilot wheel at one rate of speed during the entire travel of the gate, as shown in Fig. 21. If more power is required it can be obtained by the addition of the spur gearing shown in Fig. 22, which increases the power 3.2 times, thus making the Lift very powerful for starting the gate with the crank on the lower shaft. After the gate has been partly raised and the pressure somewhat equalized, the crank can be moved to the upper shaft and the gate operated much faster.

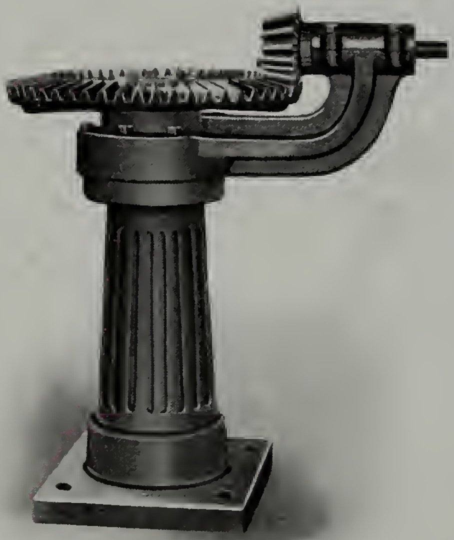


Fig. 21
Bevel Geared
One-Speed

The pedestals are heavy castings with top faced and drilled to support the bearings, and the keeper with its arm forming bearing for the pinion shaft. The large bevel gear is of cast iron and is keyed to a heavy bronze nut tapped to fit the operating stem. The lower end of the nut is fitted with a heavy collar supported by ball bearings to take the downward thrust of the weight on the stem when the gate is being raised, and with ball bearings above this collar to take the thrust when the gate is being forced down.

These Lifts are made with but one type of bearing of the nut, viz.:—double ball bearing—the most efficient.

LIST PRICES

One-Speed	$140.00
Two-Speed	155.00

Write for Discount Sheet

When Ordering, State:

Size of gate to be operated.
Greatest depth of water against center of gate.
Distance from center of gate to base of Lift.

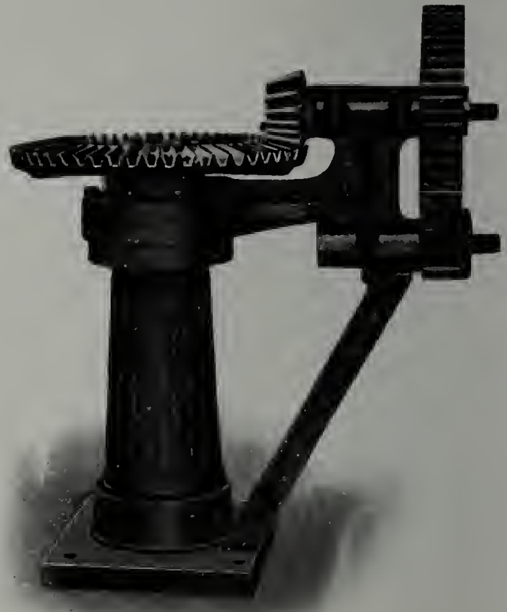


Fig. 22
Bevel Geared
Two-Speed

PEDESTAL LIFTS—Type B

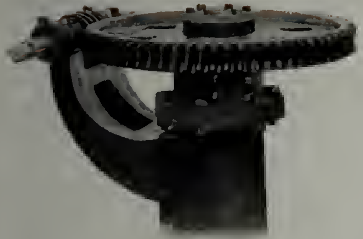


Fig. 23

We can equip Pedestal Lifts with Worm Gearing if desired. It gives a high velocity ratio with few moving parts and is non-reversible, i.e., the wheel will not drive the worm unless the pitch be excessive and it therefore serves as a safety gear.

Friction in worm gearing causes considerable loss unless the gear is exceedingly well made, requiring cut teeth to bring the friction loss within a percentage that will permit its use so far as efficiency is concerned.

Prices of Lifts, equipped with this gearing, on application.

The most powerful Gate Lift operated by hand is illustrated in Fig. 24. In addition to the bevel gearing there are two sets of spur gears, making great power available for starting the gate under heavy pressure with the shift lever in the position shown in the cut. After the gate has been partly raised and the pressure relieved, the shift lever is thrown to the right, disengaging the first pair of spur gears so that the power from the crank is transmitted directly to the pinion of the bevel gearing. This gives higher speed and reduces the time required to open the gate. The bronze nut to which the bevel gear wheel is keyed is equipped with heavy ball bearings to take the thrust both of opening and closing the gate, which greatly reduces the friction. All spur gears have cut teeth to secure the maximum efficiency, and the bevel gears, ordinarily furnished with cast teeth, can be furnished with cut teeth at a small additional cost. The spur gears can be furnished either in cast iron or in bronze and bevel gears in cast iron or cast iron center with rim and teeth of bronze. Shaft bearings are babbitted in our standard construction, but can be bronze bushed if required. Oil cups are placed on shaft bearings and also for supplying ball bearings. The pedestal is a very heavy casting and the bracket or frame supporting the shafts for the spur gears is also of cast iron made rigid by an oblique strut securely bolted to the pedestal base.

These Lifts are made in two sizes and are of different capacities.

When Ordering or Requesting Prices, State:

Size of gate to be operated.
Greatest depth of water against center of gate.
Distance from center of gate to base of Lift.
Whether bronze or cast iron gears are desired.
Whether babbitted or bronze bushed shaft bearings.
Whether cast or cut teeth on bevel gearing.

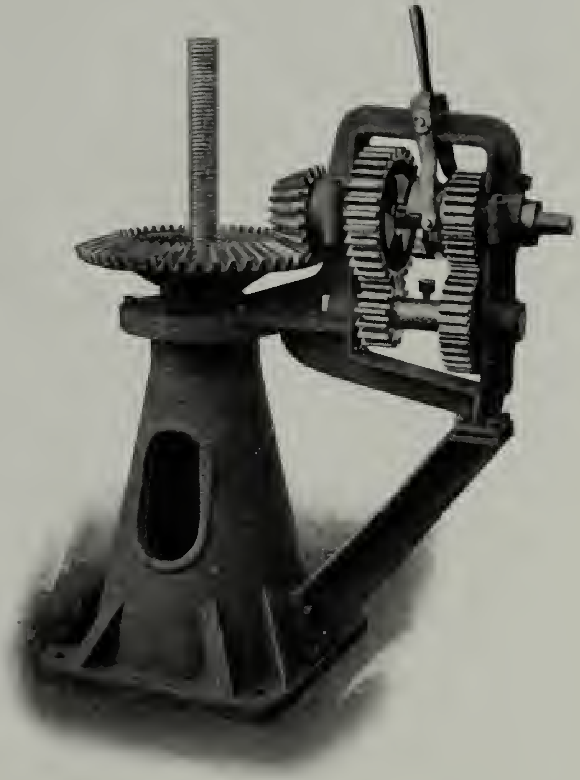


Fig. 24
Two-Speed—Shift Lever

PEDESTAL LIFTS—Type C

Rack and Pinion Lifts are used for operating gates under low heads of water. The principal advantage is in the speed with which gates can be raised or lowered. This feature, however, is exaggerated by some who claim that the gate may be quickly closed by lifting the pawl or "dog" and letting the gate drop of its own weight. **Gates should never be dropped,** as there is always the risk of breaking the teeth from shock. Teeth nearly always break from excessive backlash rather than heavy load.

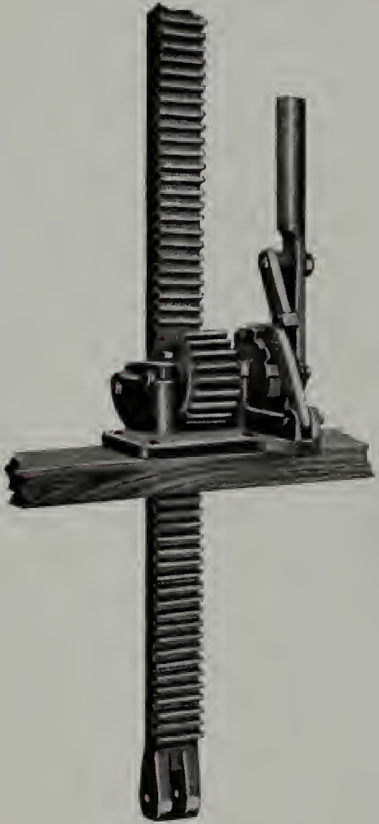


Fig. 25
Plain

Several types of these Lifts are made, Fig. 25 being the plain rack and pinion operated by a lever; Fig. 26 is the geared type, the gears making the movement of the gate slower, but affording more than three times the power of the smaller Lift. Both these are operated by a reversible ratchet lever, so that the power may be applied for raising or lowering.

We also make a Lift similar to Fig. 26, but operated after the manner of Fig. 27 (opp. page). Worm gearing is substituted for the spur gearing and the Lift is actuated by a pilot wheel. This is the ideal construction for rack and pinion Lifts. It has the capacity, and the pilot wheel can be operated much quicker than the lever, but the greatest advantage is in the fact that the worm gearing is non-reversible; the worm wheel will not drive the worm. This makes dropping the gate impossible, and also permits it to be raised to any height and left in that position without other means of support.

LIST PRICES

Plain, without rack	$20.00
Spur Geared, without rack	38.00
Worm Geared, without rack, Pilot Wheel included	46.00
Reversible Ratchet Levers	9.00
Rack—3 ft. or less in length	6.00
Additional length—per foot	1.50

WRITE FOR DISCOUNT SHEET

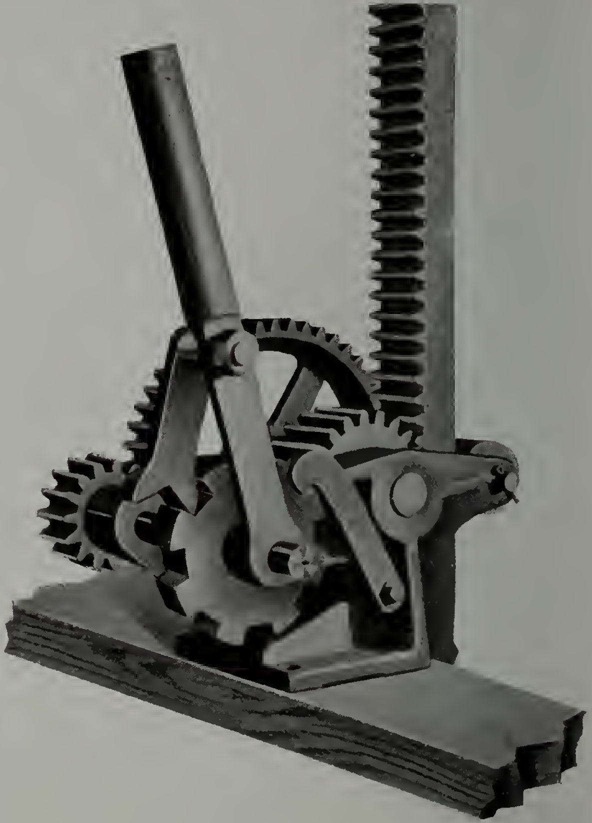


Fig. 26
Geared

RACK AND PINION LIFTS

If it is necessary to use gates that have greater width than height, much better operation will result if two stems are used which will keep the gate from binding in the guides. This necessitates the Twin Stem Rack and Pinion Lift, Fig. 27.

The construction is the same as for the Lifts described on page 22. The pinions and rollers can be made for use with wood stems on which the cast iron racks are bolted or for our standard cast iron rack stem.

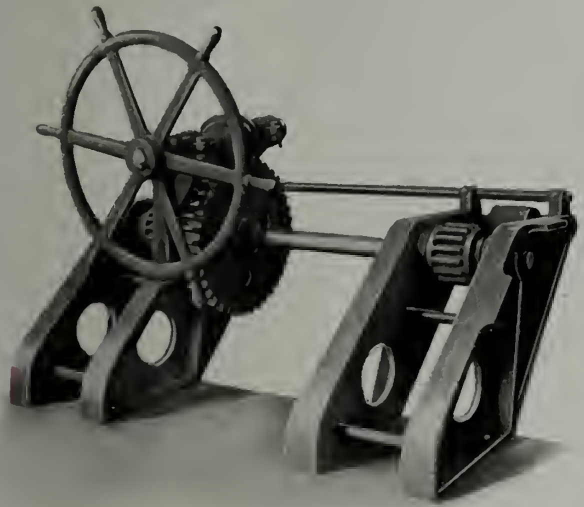


Fig. 27

As the length of shafting and tie rods is governed by the width of the gate, prices will be quoted on receipt of the following information:

Width and height of gate to be operated.
Greatest depth of water against center of gate.
Kind of gate—whether wood or metal.
Guides—whether wood or metal.
Distance from center of gate to base of Lift.

TWIN STEM RACK AND PINION LIFT

WORM GEARED

The Winch, as a Headgate Lift, is used principally for operating Radial Gates, described on page 35. It is also used with Emergency Gates (page 12) and for lifting flash boards in some cases.

We make these in two sizes, and they are geared to such ratio that they are very powerful. The drums are made for wire rope and the pinion shafts are both squared at the ends, making two speeds possible.

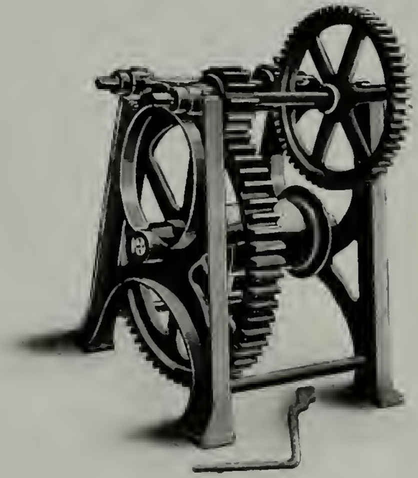


Fig. 28

LIST PRICES

No. 1	$120.00
No. 2	60.00

WRITE FOR DISCOUNT SHEET

When Ordering, State:

Kind of gate to be operated.
Size of gate to be operated.
Greatest depth of water against center of gate.
Length of cable required. Cable is not included in above prices.

WINCH

FOR LIFTING RADIAL GATES OR FLASH BOARDS

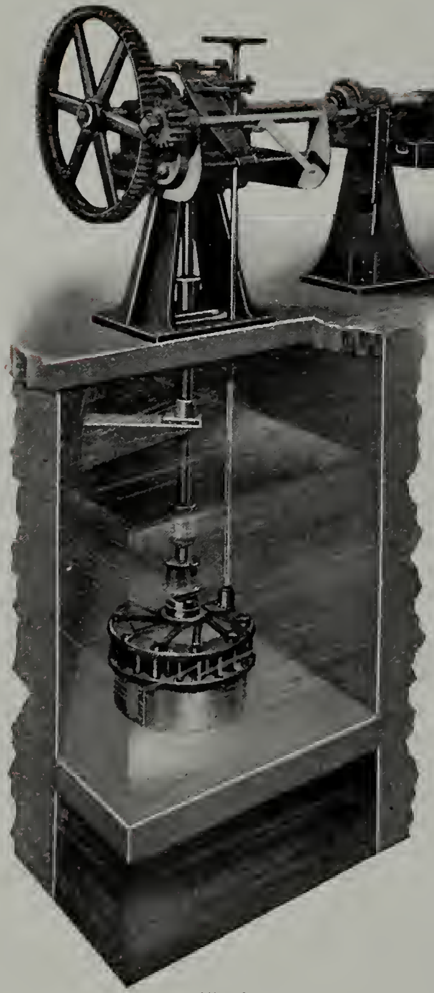


Fig. 29

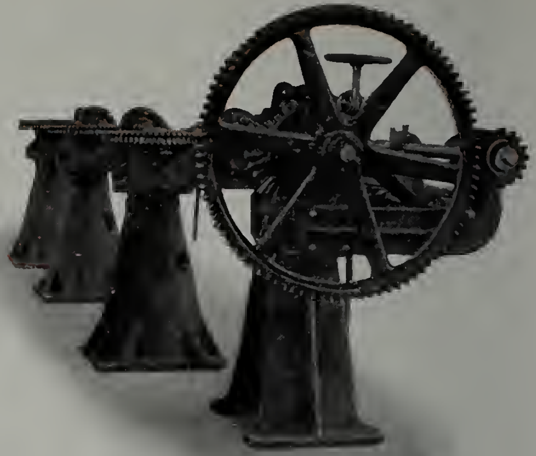


Fig. 30

Wherever power, either electric or water, is available, it is well worth the additional expense necessary in providing machinery for operating gates or valves. It is impossible to obtain what can actually be termed "speed," with machinery or Lifts operated by hand. Usually only one man is employed to look after the operation of headgates, and the machinery, whatever its type, must be designed so that this one man can conveniently raise and lower the gates. One man can furnish but little power, comparatively, hence no speed. With Operating Machinery one man can control great power, and is then able to operate large gates very quickly.

We design and manufacture machinery for any and all requirements. There is no real standard in our designs, as conditions are different in nearly every case. Fig. 29 illustrates hydraulically operated mechanism for lifting three gates. The power is derived from a turbine under low head and transmitted through mitre gears to the horizontal driving shaft. The mitre gearing is reversible, so that the shaft may be driven in either direction, making the power available for raising or lowering. Each gate is operated separately by means of a friction clutch through worm gearing.

Fig. 30 is a back view of the machinery and also shows the large spur gear and pinion with pinion shaft squared to receive a crank for hand operation when necessary.

To design and furnish estimates we must have information complete in every detail.

GATE OPERATING MACHINERY

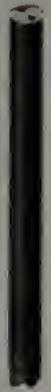


Fig. 31

GATE STEMS

Price Per Foot

Size Inches	Solid	Pipe Ex. Heavy
1	$ .22	$ .22
1 ⅛	.26	
1 ¼	.32	.30
1 ½	.42	.36
1 ¾	.58	
2	.74	.50
2 ¼	.94	
2 ½	1.20	.80
2 ¾	1.40	
3	1.70	1.10

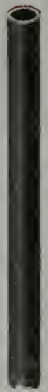


Fig. 32

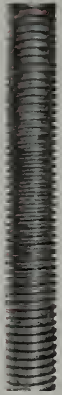


Fig. 33

SCREWS

Price Per Foot

Size Stem Inches	Number Threads Per Inch			
	4	3	2	2-Double
1	$ .40			$ .40
1 ⅛	.50			.50
1 ¼	.60			.60
1 ½	.80			.80
1 ¾	1.00	$1.00		
2	1.20	1.20		
2 ¼	1.70	1.70		
2 ½	2.20	2.20		
2 ¾	4.50	4.50	$4.50	
3	5.50	5.50	5.50	

Prices on application for Screws with other threads.

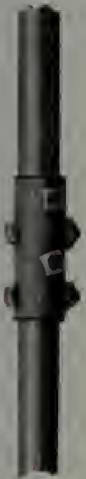


Fig. 34

STEM COUPLINGS

Price Each

Size Stem Inches	For Solid Stem	For Pipe Stem
1	$ 2.70	
1 ⅛	3.40	
1 ¼	4.10	
1 ½	4.90	$ 3.00
1 ¾	5.70	
2	6.60	4.00
2 ¼	7.50	
2 ½	8.60	5.00
2 ¾	9.70	
3	11.00	6.00

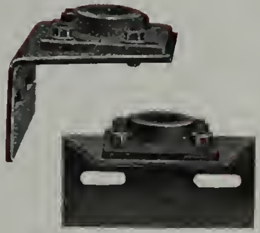


Fig. 35

STEM GUIDES

Price Each

Size Stem Inches	For Solid Stem	For Pipe Stem
1	$ 2.00	
1 ⅛	2.20	
1 ¼	2.50	
1 ½	2.70	$ 3.20
1 ¾	2.90	
2	3.20	4.50
2 ¼	3.50	
2 ½	4.00	6.00
2 ¾	4.50	
3	5.00	7.50

STEMS, SCREWS, STEM COUPLINGS, STEM GUIDES

In the design of "Kennedy" Valves there has been combined **simplicity** and **effectiveness.** These qualities, with superior workmanship and material and reasonable prices, will account for their popularity, which is evidenced by steadily increasing demand, both domestic and foreign, necessitating the building of an entire new plant, embodying all the best features of modern manufacturing and commercial practice.

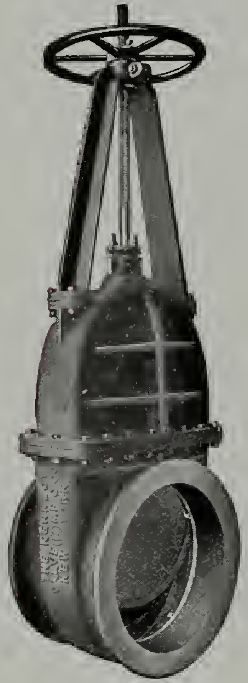


Fig. 36

"Light" Outside Rising Stem and Yoke Gate Valve, Flanged

These have Steel Stems, unless otherwise specified.
75 lbs. Test Pressure.
Furnished without ribbing for 30 lb. test and more heavily ribbed for 100 lb. test.

Besides the regular lines illustrated, we can furnish any possible modifications or combinations of one kind with another, any variations of connections, flanges, dimensions, etc., but standard goods are put through the various operations of manufacture in large quantities to effect all possible economies in production, while goods departing from standard, made up as they generally are in small quantities, would not partake of such economies and would cost what might be considered outside of manufacturing circles, disproportionately extra, although our charge for extras would be as reasonable as we could possibly afford. Goods departing from standard, requiring special care and special operations, also cannot always be turned out as quickly as might be expected.

GENERAL SPECIFICATIONS

Pressures—While certain pressures are specified in this catalogue, valves can be furnished for intermediate pressures.

Self-Packing Device—All outside rising stem and yoke gate valves, for whatever pressure, and inside stationary stem gate valves for "medium heavy" and "extra heavy" pressures, are constructed so that they can be repacked while under pressure and open; a very desirable feature, which will be much appreciated by engineers.

Directions for Opening—All valves with screwed stems are made to **open by turning the stem toward the left,** unless otherwise ordered. Stems are of ample diameter and most approved form of thread.

Materials—Iron Body Valves. Bodies, caps, stuffing boxes, glands and wheels are made of a mixture of cast iron, shown by long experience to be perfectly adapted to its purpose. Discs in gate valves of the smaller sizes of solid bronze, and, in the larger sizes, of cast iron, with disc rings of bronze. Stems of bronze, except in outside rising stem and yoke gate valves, where, in the larger sizes, for some classes of service, they are made of best quality of steel, in which case the gland is bronze bushed. Stem nuts, cams and seat rings of bronze. Bolts of best refined wrought iron, with standard hexagon nuts.

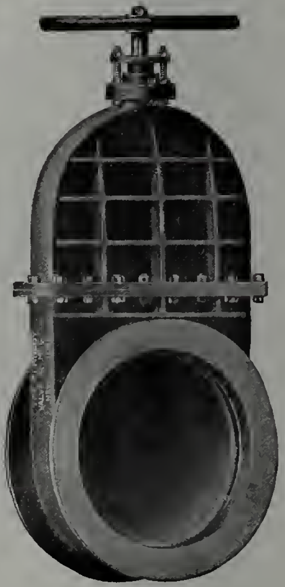


Fig. 37

"Light" Inside Stationary Stem Gate Valve, Flanged

75 lbs. Test Pressure.
Furnished without ribbing for 30 lb. test and more heavily ribbed for 100 lb. test.

GATE VALVES

DOUBLE DISC PARALLEL SEAT

GENERAL SPECIFICATIONS
Continued

Gearing—Applicable to these valves is shown in Fig. 38, Bevel Gearing; and in Fig. 39, Spur Gearing. Gearing is recommended as follows: "Light" Valves, on the larger sizes and on 42″ and larger is always supplied, unless otherwise stated; "Standard" Valves, on the larger sizes and on 30″ and larger, is always supplied, unless otherwise stated; "New Type" Valves, on 20″ and larger; and on sizes 30″ and larger is always supplied, unless otherwise stated.

Workmanship—Is of the best. Appliances, in all branches, are thoroughly "up-to-date." All parts are made interchangeable, and every valve is subjected to **thorough test and inspection** before leaving the works.

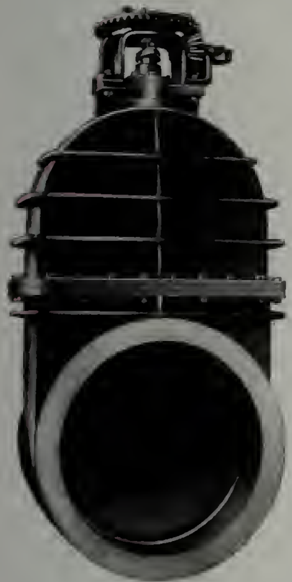


Fig. 38

"Light" Inside Stationary Stem Gate Valve, Flanged with Bevel Gearing

75 lbs. Test Pressure—Can Be More Heavily Ribbed for 100 lb. Test

TABLE OF TEST AND WORKING PRESSURES
In Pounds Per Square Inch

CLASS	SIZES Inches	Pressures	
		Test	Working
"Light"		30	15
		75	35
		100	50
"Standard"	1½ to 8	300	150
	9 to 14	250	125
	16 to 48	200	100
	16 to 48	250	125
	24 to 48	300	150
	24 to 48	400	200
"New Type"	2 to 8	400	200
	10 to 48	300	150

While tests on these valves show that they may possibly, with safety, be used with higher working pressures, yet they are not so recommended nor guaranteed.

Limited space prohibits further illustration of valves of other types. We are prepared to quote and supply valves for every purpose and condition.

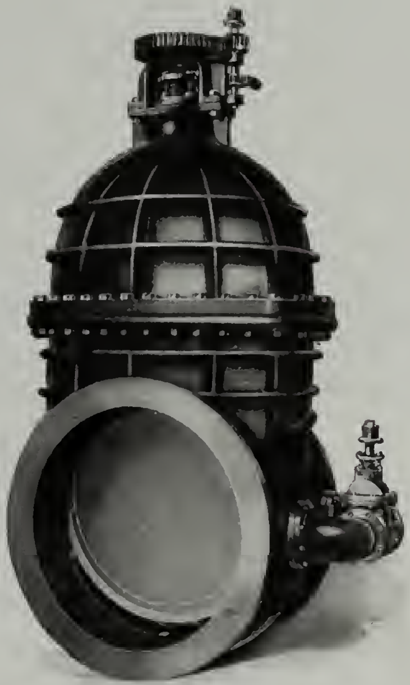


Fig. 39

"New Type" Extra Heavy Inside Stationary Stem Gate Valve, Flanged, with Spur Gearing, Indicator and By-Pass

Ribbed for 400 lbs. Test Pressure—Furnished for "Medium Heavy" Pressure, 300 lb. Test

GATE VALVES
DOUBLE DISC PARALLEL SEAT

"HYDRODUCT" is the result of years of study and research with one purpose in mind, viz., the production of a perfect metal flume embodying correct mechanical construction, the applicability of the most scientific hydraulic principles and the practical requisites of transportation, installation and operation. After determining each of these necessities mentally and graphically, the fact still remained that the flume must be produced without eliminating any of them, and in the finished product is found evidence that it is so manufactured.

"HYDRODUCT" presents a smoother surface to the flow of water than any other metal flume on the market. This is due partly to the design of the joint and partly to the care exercised in manufacturing, which, taken together, give it the greatest carrying capacity.

"HYDRODUCT" is made in sections connected by a Wedged Joint without the use of rivets or solder. Each section is made from a flat sheet of metal corresponding in length to the perimeter of the flume, the width differing in some of the sizes but always selected for greatest strength and economy. The finished sections are semi-circular and each one has a small groove in one edge and a large groove in the other. (See Fig. 45.) The large groove fits between the wings of the Wing Bar, the small groove fits into the large groove and the Wedge Bar fits into the small groove exactly. The wings are sheared from each end of the Wing Bar (Fig. 44) leaving a round section which is threaded and when the nuts are drawn tight on each end, the Wedge Bar "A" (Fig. 46) is forced down into the grooves in the sheets or flume sections and **wedges** the two sections between the wings "B-B" (Fig. 46) of the Wing Bar, making a water-tight joint. ***"HYDRODUCT"*** **is the only product of its kind in which the wedging principle is employed in making the joint.**

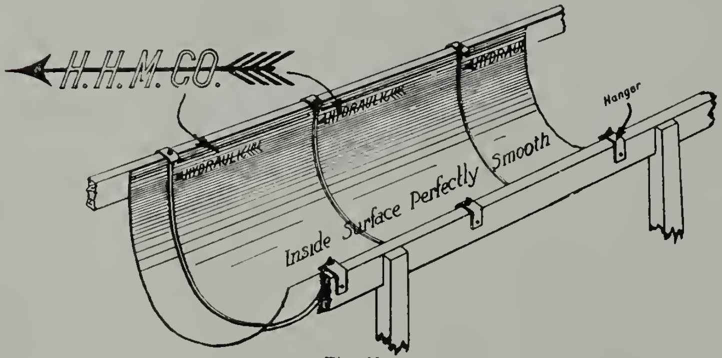


Fig. 40
Flume Supported by Hangers
Waterway Has Open Top

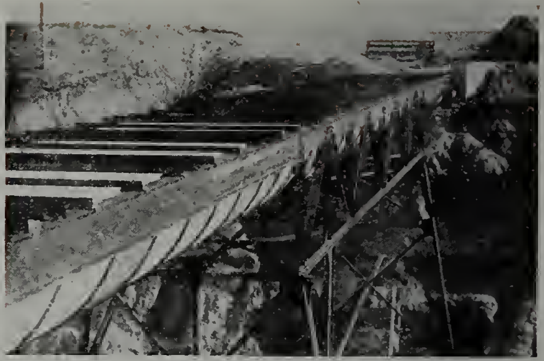


Fig. 41
Flume Supported by Steel Carriers
Steel Substructure

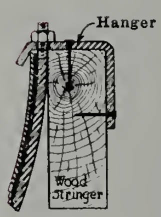


Fig. 42

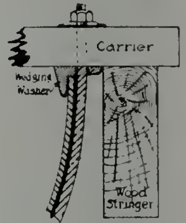


Fig. 43

"HYDRODUCT" is made, in smaller sizes, for support by Hangers (Fig. 42) making an open top flume (Fig. 40), or for support by carriers (Fig. 43) extending across the top, made of wood or steel (Fig. 41). In larger sizes we recommend Carriers, as the Hangers produce torsion or twisting in the stringers, as the weight is transferred and the necessary construction to overcome the stresses thus produced would not be economical.

For Table of Velocity and Discharge of 22 sizes of *"HYDRODUCT"* on fifteen different slopes, see pages 30 and 31.

"HYDRODUCT"—**THE ULTIMATE METAL FLUME**

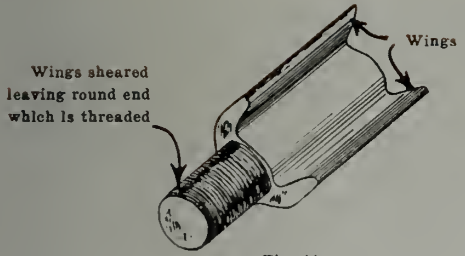


Fig. 44

WING BAR
The outside member used in making the water-tight, wedged flume joint

Examine the Joint; it is **efficient and correct in design because** it affords a perfectly smooth surface for the flow of water.

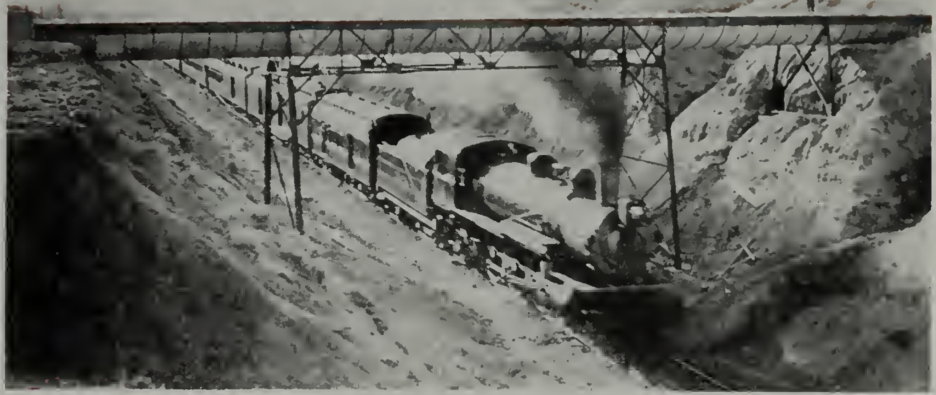
Because the rigid bar is on the outside, where it is required to support the weight and maintain the cross-sectional shape.

Because the metal sheets are **wedged**, not simply "clamped," between the joint bars.

Because the weight of water, carried by the metal sheets, is supported on each side of the joint at "B"—"B" (Fig. 46) close to the point where the sheets are bent downward.

EXPANSION JOINTS

Our Expansion Joint is as simple in construction as the regular Wedged Joint between sections. It has no rivets nor solder, is efficient, easily erected and requires no more room between stringers than that provided for the waterway—a very desirable feature. Expansion Joints are furnished as requested.



NO. 132 "HYDRODUCT" OVER C. B. & Q. R. R., MAIN LINE, NEAR KEENSBURG, COLO.
Erected by the Henrylyn Irrigation District
Diameter of Flume, 7 Feet; Height Above Rail, 29 Feet—Substructure of Structural Steel

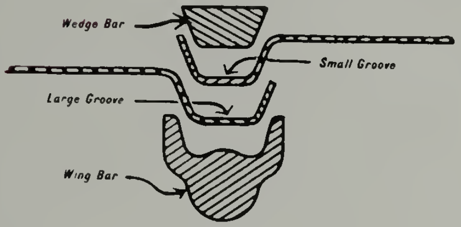


Fig. 45

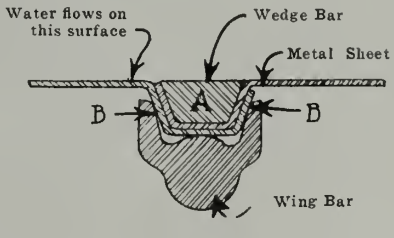


Fig. 46

PRICES

Prices will be quoted on receipt of the following information:
Size and length of flume required.
Nearest railroad point.
Or, Quantity of water to be carried—either in cubic feet per second, gallons per minute or miner's inches.
Grade or fall per 100 ft. or per mile.
Length of flume required.
Nearest railroad point.

"HYDRODUCT"—THE ULTIMATE METAL FLUME

VELOCITY AND DISCHARGE TABLE

Co-efficient of Roughness $n = .010$ Kutter's formula

COMPUTED "FLOWING FULL" AND WITH "FREEBOARD"

Diameter in feet
F=Fall in feet per mile
S=Slope per unit of length

$$\text{Hydraulic Radius} = \frac{\text{area}}{\text{wetted perimeter}}$$

Area in square feet
Q=Quantity discharged in cubic feet per second
V=Mean velocity in feet per second

Size No.	Diam.	Condition	Area	HYDR. RAD.	F	1.320	1.584	2.112	2.640	3.168	3.696	4.224	4.752	5.280	6.600	7.920	9.240	10.56	13.20	15.84
					S	0.00025	0.0003	0.0004	0.0005	0.0006	0.0007	0.0008	0.0009	0.0010	0.00125	0.0015	0.00175	0.0020	0.0025	0.0030
24	1.27	Flowing Full	0.63	0.32	Q	0.67	0.74	0.87	0.98	1.07	1.17	1.25	1.33	1.40	1.57	1.73	1.87	2.00	2.23	2.46
					V	1.07	1.18	1.38	1.55	1.70	1.85	1.98	2.11	2.23	2.50	2.74	2.97	3.18	3.54	3.90
		1" Freeboard	0.52	0.28	Q	0.50	0.56	0.65	0.73	0.80	0.87	0.93	0.99	1.05	1.18	1.29	1.40	1.50	1.67	1.84
					V	0.96	1.07	1.25	1.40	1.54	1.68	1.79	1.91	2.02	2.27	2.48	2.69	2.88	3.22	3.54
30	1.59	Flowing Full	0.99	0.39	Q	1.23	1.37	1.58	1.79	1.97	2.11	2.29	2.44	2.56	2.88	3.16	3.42	3.65	4.02	4.63
					V	1.25	1.38	1.60	1.81	1.99	2.15	2.31	2.46	2.59	2.91	3.19	3.46	3.69	4.06	4.68
		1⅛" Freeboard	0.83	0.35	Q	0.95	1.05	1.23	1.38	1.52	1.64	1.76	1.88	1.98	2.22	2.43	2.64	2.82	3.13	3.46
					V	1.15	1.27	1.48	1.66	1.83	1.98	2.12	2.26	2.39	2.68	2.93	3.18	3.40	3.77	4.17
36	1.91	Flowing Full	1.43	0.48	Q	2.05	2.29	2.66	2.99	3.29	3.56	3.82	4.07	4.28	4.79	5.27	5.69	6.09	6.70	7 48
					V	1.44	1.60	1.86	2.09	2.30	2.49	2.67	2.84	2.99	3.35	3.68	3.98	4.26	4.69	5.23
		1¼" Freeboard	1.22	0.43	Q	1.63	1.80	2.10	2.37	2.60	2.81	3.01	3.21	3.39	3.79	4.17	4.52	4.82	5.30	5.92
					V	1.34	1.48	1.72	1.94	2.13	2.30	2.47	2.63	2.78	3.11	3.42	3.70	3.95	4.34	4.85
48	2.54	Flowing Full	2.54	0.63	Q	4.44	4.93	5.74	6.45	7.07	7.65	8.20	8 72	9.19	10.29	11.30	12.24	13.08	14.43	16 05
					V	1.75	1.94	2.26	2.54	2.78	3.01	3.23	3.43	3.62	4.05	4.45	4.82	5.15	5.68	6 32
		1½" Freeboard	2.21	0.58	Q	3.64	4.04	4.71	5.30	5.81	6.28	6.74	7.16	7.56	8.46	9.30	10.05	10.74	11.85	13.22
					V	1.65	1.83	2.13	2.40	2.63	2.84	3.05	3.24	3.42	3.83	4.21	4.55	4.86	5.36	5.98
60	3.18	Flowing Full	3.98	0.79	Q	8.19	9.03	10.51	11.78	12.93	14.01	15.00	15.92	16.79	18.82	20.65	22.32	23.88	26.46	29.29
					V	2.06	2.27	2.64	2.96	3.25	3.52	3.77	4.00	4.22	4.73	5.19	5.61	6.00	6.64	7 36
		1¾" Freeboard	3.50	0.74	Q	6.86	7.56	8.78	9.90	10.85	11.76	12.60	13.37	14.11	15.79	17.36	18.76	20.06	22.22	24.64
					V	1.96	2.16	2.51	2.83	3.10	3.36	3.60	3.82	4.03	4.51	4.96	5.36	5.73	6.34	7.04
72	3.82	Flowing Full	5.73	0.95	Q	13.35	14.72	17.07	19.19	21.02	22.74	24.41	25.90	27.27	30.59	33.52	36.21	38.79	42.93	47.55
					V	2.33	2.57	2.98	3.35	3.67	3.97	4.26	4.52	4.76	5.34	5.85	6.32	6.77	7.49	8.30
		2" Freeboard	5.09	0.90	Q	11.45	12.57	14.60	16.44	18.01	19.49	20.86	22.19	23.36	26.21	28.75	31.04	33.23	36.81	40.77
					V	2.25	2.47	2.87	3.23	3.54	3.83	4.10	4.36	4.59	5.15	5.65	6.10	6.53	7.23	8.01
84	4.46	Flowing Full	7.80	1.11	Q	20.20	22.15	25.81	28.93	31.74	34.32	36.73	39.00	41.10	46.09	50.46	54.59	58.34	64.59	71.60
					V	2.59	2.84	3.31	3.71	4.07	4.40	4.71	5.00	5.27	5.91	6.47	7.00	7.48	8.28	9.18
		2¼" Freeboard	6.96	1.05	Q	17.40	19.07	22.20	24.81	27.35	29.57	31.66	33.61	35.42	39.67	43.50	46.97	50.31	55.62	61.66
					V	2.50	2.74	3.19	3.58	3.93	4.25	4.55	4.83	5.09	5.70	6.25	6.75	7.23	7.99	8.86
96	5.09	Flowing Full	10.18	1.27	Q	28.80	31.65	36.74	41.22	45.19	48.86	52.42	55.58	58.63	65.55	71.87	77.67	83.06	92.00	102.10
					V	2.83	3.11	3.61	4.05	4.44	4.80	5.15	5.46	5.76	6.44	7.06	7.63	8.16	9.03	10.03
		2½" Freeboard	9.12	1.20	Q	24.89	27.36	31.82	35.65	39.12	42.31	45.32	48.06	50.70	56.72	62.19	67.21	71.86	79.42	88.18
					V	2.73	3.00	3.49	3.91	4.29	4.64	4.97	5.27	5.56	6.22	6.82	7.37	7.88	8.70	9.67
108	5.73	Flowing Full	12.89	1.43	Q	39.57	43.31	50.27	56.32	61.87	66.89	71.53	75.92	80.17	89.71	98.22	106.08	113.56	126.08	139.59
					V	3.07	3.36	3.90	4.37	4.80	519	5.55	5.89	6.22	6.96	7.62	8.23	8.81	9.78	10.83
		2¾" Freeboard	11.57	1.35	Q	34.13	37.48	43.50	48.71	53.45	57.85	61.89	65.71	69.30	77.63	85.03	91.86	98.22	108.88	120.79
					V	2.95	3.24	3.76	4.21	4.62	5.00	5.35	5.68	5.99	6.71	7.35	7.94	8.49	9.41	10.44
120	6.36	Flowing Full	15.91	1.59	Q	52.34	57.27	66.50	74.45	81.77	88.45	94.66	100.23	105.80	118.37	129.82	140.16	149.87	166.59	183.76
					V	3.29	3.60	4.18	4.68	5.14	5.56	5.95	6.30	6.65	7.44	8.16	8.81	9.42	10.47	11.55
		3" Freeboard	14.32	1.50	Q	45.25	49.68	57.56	64.58	70.88	76.61	81.90	86.92	91.78	102.67	112.55	121.60	130.02	144.59	159.66
					V	3.16	3.47	4.02	4.51	4.95	5.35	5.72	6.07	6.41	7.17	7.86	8.49	9.08	10.10	11.15

"HYDRODUCT"—THE ULTIMATE METAL FLUME

Size No.	Diam.	Condition	Area	HYDR. RAD.	F	1.320	1.584	2.112	2.640	3.168	3.696	4.224	4.752	5.280	6.600	7.920	9.240	10.56	13.20	15.84
					S	0.00025	0.0003	0.0004	0.0005	0.0006	0.0007	0.0008	0.0009	0.0010	0.00125	0.0015	0.00175	0.0020	0.0025	0.0030
132	7.00	Flowing Full	19.25	1.75	Q	67.37	75.07	85.47	95.67	105.10	113.57	121.27	128.78	135.90	151.88	166.51	179.99	192.69	213.91	236.20
					V	3.50	3.90	4.44	4.97	5.46	5.90	6.30	6.69	7.06	7.89	8.65	9.35	10.01	11.11	12.27
		3¼" Freeboard	17.35	1.65	Q	58.29	64.01	74.25	83.10	91.25	98.54	105.48	112.16	117.97	132.03	144.69	156.49	167.25	185.86	205.07
					V	3.36	3.69	4.28	4.79	5.26	5.68	6.08	6.45	6.80	7.61	8.34	9.02	9.64	10.71	11.82
144	7.64	Flowing Full	22.92	1.91	Q	84.57	92.82	107.72	120.32	132.02	142.79	152.64	162.04	170.98	191.14	209.48	226.67	242.49	269.08	296.58
					V	3.69	4.05	4.70	5.25	5.76	6.23	6.66	7.07	7.46	8.34	9.14	9.89	10.58	11.74	12.94
		3½" Freeboard	20.70	1.81	Q	73.90	81.14	93.77	105.15	115.30	124.82	133.30	141.58	149.25	166.84	182.99	197.68	211.76	233.37	259.57
					V	3.57	3.92	4.53	5.08	5.57	6.03	6.44	6.84	7.21	8.06	8.84	9.55	10.23	11.27	12.54
156	8.28	Flowing Full	26.89	2.06	Q	104.33	114.28	132.29	147.89	162.41	175.32	187.69	199.25	210.01	235.02	257.60	279.11	297.93	330.98	364.09
					V	3.88	4.25	4.92	5.50	6.04	6.52	6.98	7.41	7.81	8.74	9.58	10.38	11.08	12.30	13.54
		3¾" Freeboard	24.29	1.96	Q	91.32	100.07	116.10	129.70	142.33	153.75	164.44	174.64	184.11	205.97	225.65	244.35	261.35	287.01	319.16
					V	3.76	4.12	4.78	5.34	5.86	6.33	6.77	7.19	7.58	8.48	9.29	10.06	10.76	11.81	13.14
168	8.91	Flowing Full	31.19	2.22	Q	126.94	139.10	160.93	179.96	197.43	213.02	228.31	242.03	255.12	285.69	312.83	338.71	360.86	401.42	442.26
					V	4.07	4.46	5.16	5.77	6.33	6.83	7.32	7.76	8.18	9.16	10.03	10.86	11.57	12.87	14.18
		4" Freeboard	28.25	2.11	Q	111.30	122.03	141.25	157.91	173.17	187.00	200.28	212.43	224.02	250.57	274.58	297.46	317.23	352.65	388.14
					V	3.94	4.32	5.00	5.59	6.13	6.62	7.09	7.52	7.93	8.87	9.72	10.53	11.23	12.48	13.74
180	9.55	Flowing Full	35.81	2.38	Q	152.18	166.87	193.01	215.57	236.34	255.67	273.58	289.69	305.80	341.98	370.63	406.08	434.38	480.74	530.69
					V	4.25	4.66	5.39	6.02	6.60	7.14	7.64	8.09	8.54	9.55	10.35	11.34	12.13	13.42	14.82
		4¼" Freeboard	32.50	2.27	Q	134.22	146.90	169.97	190.12	208.32	225.22	241.14	255.44	269.42	301.59	328.90	357.82	381.54	423.95	467.33
					V	4.13	4.52	5.23	5.85	6.41	6.93	7.42	7.86	8.29	9.28	10.12	11.01	11.74	13.04	14.38
192	10.18	Flowing Full	40.74	2.54	Q	180.07	197.58	228.14	255.43	279.88	302.69	323.47	343.03	362.17	405.36	444.87	478.69	514.13	569.16	626.97
					V	4.42	4.85	5.60	6.27	6.87	7.43	7.94	8.42	8.89	9.95	10.92	11.75	12.62	13.97	15.39
		4½" Freeboard	36.90	2.42	Q	158.30	173.80	200.72	224.71	246.11	266.04	284.49	301.83	318.44	356.07	389.65	422.49	452.38	500.44	552.38
					V	4.29	4.71	5.44	6.09	6.67	7.21	7.71	8.18	8.63	9.65	10.56	11.45	12.26	13.56	14.97
204	10.82	Flowing Full	45.99	2.70	Q	211.09	231.79	267.65	299.39	328.36	354.57	378.94	402.40	424.02	473.68	521.97	561.06	600.16	667.27	733.53
					V	4.59	5.04	5.82	6.51	7.14	7.71	8.24	8.75	9.22	10.30	11.35	12.20	13.05	14.50	15.95
		4¾" Freeboard	41.66	2.57	Q	185.80	203.71	235.37	263.28	288.69	311.61	333.27	353.26	372.84	417.41	458.66	492.40	529.48	586.24	645.29
					V	4.46	4.89	5.65	6.32	6.93	7.48	8.00	8.48	8.95	10.02	11.01	11.82	12.71	14.07	15.49
216	11.46	Flowing Full	51.56	2.86	Q	245.42	269.14	310.90	347.50	381.02	411.44	439.79	467.12	492.39	549.09	604.26	652.23	695.00	775.52	851.24
					V	4.76	5.22	6.03	6.74	7.39	7.98	8.53	9.06	9.55	10.65	11.72	12.65	13.48	15.04	16.51
		5" Freeboard	46.71	2.72	Q	215.80	236.34	273.24	305.47	334.89	361.99	386.75	410.56	432.53	482.97	532.47	572.65	611.88	680.84	748.28
					V	4.62	5.06	5.85	6.54	7.17	7.75	8.28	8.79	9.26	10.34	11.40	12.26	13.10	14.57	16.02
228	12.09	Flowing Full	57.45	3.02	Q	283.22	310.23	357.90	400.42	439.49	473.96	506.70	537.72	566.44	634.23	692.26	749.72	801.99	894.04	980.66
					V	4.93	5.40	6.23	6.97	7.65	8.25	8.82	9.36	9.86	11.04	12.05	13.05	13.96	15.56	17.07
		5¼" Freeboard	52.04	2.87	Q	248.22	272.16	314.31	351.26	385.60	416.31	444.92	472.51	498.01	553.25	610.93	659.33	703.04	775.48	860.71
					V	4.77	5.23	6.04	6.75	7.41	8.00	8.55	9.08	9.57	10.67	11.74	12.67	13.51	14.90	16.54
240	12.73	Flowing Full	63.66	3.18	Q	324.03	354.58	409.33	458.34	502.26	541.72	579.29	614.93	646.77	723.15	792.54	856.21	919.22	1021.13	1122.30
					V	5.09	5.57	6.43	7.20	7.89	8.51	9.10	9.66	10.16	11.36	12.45	13.45	14.44	16.04	17.63
		5½" Freeboard	57.83	3.03	Q	285.67	312.85	360.85	403.64	442.96	478.34	511.21	542.44	571.35	639.58	697.99	755.82	809.02	901.70	988.87
					V	4.94	5.41	6.24	6.98	7.66	8.27	8.84	9.38	9.88	11.06	12.07	13.07	13.99	15.59	17.10
252	13.37	Flowing Full	70.18	3.34	Q	367.74	402.83	463.88	519.32	568.44	614.06	656.87	698.97	734.07	822.49	899.68	969.86	1040.05	1158.82	1273.76
					V	5.24	5.74	6.61	7.40	8.10	8.75	9.36	9.96	10.46	11.72	12.82	13.82	14.82	16.51	18.15
		5¾" Freeboard	63.75	3.18	Q	324.48	355.08	409.91	458.99	502.98	542.50	580.12	615.81	647.69	724.18	793.67	857.43	920.53	1022.58	1123.90
					V	5.09	5.57	6.43	7.20	7.89	8.51	9.10	9.66	10.16	11.36	12.45	13.45	14.44	16.04	17.63
258	13.69	Flowing Full	73.57	3.42	Q	391.39	428.91	494.40	553.98	606.21	654.78	699.55	745.27	782.79	878.43	959.35	1033.72	1107.23	1196.23	1358.10
					V	5.32	5.83	6.72	7.53	8.24	8.90	9.51	10.13	10.64	11.94	13.04	14.05	15.05	16.26	18.44
		6" Freeboard	66.74	3.25	Q	344.38	377.08	435.15	487.20	534.59	575.96	615.34	654.05	687.42	768.84	842.26	909.00	975.74	1051.80	1193.30
					V	5.16	5.65	6.52	7.30	8.01	8.63	9.22	9.80	10.30	11.52	12.62	13.62	14.62	15.76	17.88

The above velocities must be produced before the water enters the flume, in order to obtain the corresponding discharge and economical use of a given size. If this is not done, the flume will overflow at the intake and run only about half full at the discharge end.

"HYDRODUCT"—THE ULTIMATE METAL FLUME

WATER PIPE
FOR WATER WORKS, WATER POWERS ETC.

Diameter Inches	Gauge Steel U. S. Std.	Weight Per Foot Pounds	Price Per Foot	Safe Working Pressure	Safe Head Feet
5	18	3.29	$ .24	180	415
5	16	4.10	.25	225	518
5	14	5.14	.31	281	648
6	18	3.88	.25	150	346
6	16	4.85	.28	187	432
6	14	6.06	.34	234	540
6	12	8.79	.53	328	756
7	18	4.45	.29	128	296
7	16	5.56	.32	160	370
7	14	6.96	.38	201	463
7	12	10.08	.55	267	648
7	11	11.12	.70	321	741
8	18	5.02	.33	112	259
8	16	6.27	.36	141	322
8	14	7.85	.44	176	405
8	12	11.38	.57	246	567
8	11	12.55	.75	281	648
8	10	14.12	.85	316	729
8	8	18.25	1.15	386	892
9	18	5.75	.37	100	231
9	16	7.19	.40	125	288
9	14	9.02	.49	156	360
9	12	13.06	.65	218	504
9	11	14.38	.77	250	567
9	10	16.19	.87	281	648
9	8	20.77	1.20	343	792
10	18	6.39	.42	90	207
10	16	7.98	.44	112	259
10	14	9.98	.53	140	324
10	12	14.50	.73	197	454
10	11	15.96	.80	225	519
10	10	17.97	.90	253	583
10	8	22.94	1.25	309	713
11	18	6.98	.43	82	189
11	16	8.72	.46	102	235
11	14	10.91	.57	128	295
11	12	15.84	.79	179	413
11	11	17.44	.88	204	472
11	10	19.63	.99	230	530
11	8	24.97	1.30	280	648
12	18	7.49	$ .45	75	173
12	16	9.36	.49	94	216
12	14	11.83	.61	117	270
12	12	17.00	.85	164	378
12	11	18.72	.94	187	432
12	10	21.07	1.06	211	486
12	8	26.36	1.32	257	594
12	3–16	28.76	1.44	281	648
12	1–4	39.27	1.96	375	864
13	18	8.08	.47	69	159
13	16	10.09	.53	86	199
13	14	12.62	.65	108	249
13	12	18.33	.92	151	349
13	11	20.19	1.01	173	399
13	10	22.72	1.14	195	449
13	8	28.38	1.42	238	549
13	3–16	30.96	1.55	259	599
13	1–4	42.21	2.10	346	798
14	18	8.66	.50	64	148
14	16	10.82	.55	80	185
14	14	13.54	.68	100	231
14	12	19.67	.98	141	324
14	11	21.66	1.09	160	375
14	10	24.38	1.22	181	417
14	8	30.39	1.52	221	509
14	3–16	33.17	1.66	241	555
14	1–4	45.15	2.25	321	741
15	18	9.25	.53	.60	138
15	16	11.56	.58	75	173
15	14	14.46	.72	94	216
15	12	21.00	1.05	131	302
15	11	23.13	1.16	150	346
15	10	26.03	1.31	168	389
15	8	32.42	1.62	206	475
15	3–16	35.37	1.77	225	519
15	1–4	48.08	2.40	300	692
16	16	12.30	.62	70	162
16	14	15.38	.77	88	202
16	12	22.33	1.12	123	283
16	11	24.59	1.23	140	324
16	10	27.68	1.39	158	364
16	8	34.43	1.72	193	445
16	3–16	37.57	1.78	211	486
16	1–4	51.02	2.55	281	648
16	5–16	63.77	3.19	351	810
17	16	13.03	$ .65	66	152
17	14	16.29	.82	82	190
17	12	23.67	1.19	115	267
17	11	26.06	1.31	132	305
17	10	29.34	1.47	149	343
17	8	36.43	1.82	182	419
17	3–16	39.77	1.89	198	458
17	1–4	53.96	2.70	264	610
17	5–16	67.44	3.37	332	762
18	16	13.77	.69	62	144
18	14	17.23	.86	79	180
18	12	25.00	1.25	109	252
18	11	27.54	1.38	125	288
18	10	31.00	1.55	140	324
18	8	38.42	1.92	172	396
18	3–16	41.92	2.00	187	432
18	1–4	56.81	2.70	250	576
18	5–16	71.02	3.55	312	720
20	16	15.23	.80	56	129
20	14	19.05	.95	70	162
20	12	27.67	1.39	98	227
20	11	30.47	1.53	112	259
20	10	34.29	1.73	126	292
20	8	42.45	2.12	154	356
20	3–16	46.38	2.20	169	389
20	1–4	62.67	2.98	225	518
20	5–16	78.45	3.73	281	648
20	3–8	94.13	4.71	337	778
22	16	16.70	.88	51	118
22	14	20.89	1.05	64	147
22	12	30.33	1.52	89	206
22	11	33.41	1.67	102	235
22	10	37.60	1.88	115	265
22	8	46.49	2.33	140	324
22	3–16	50.79	2.41	153	353
22	1–4	68.55	3.26	204	471
22	5–16	85.79	4.07	255	589
22	3–8	102.93	5.15	307	707
24	16	18.17	$ .96	46	108
24	14	22.73	1.14	58	135
24	12	33.00	1.65	82	189
24	11	36.34	1.82	94	216
24	10	40.91	2.05	105	243
24	8	50.53	2.53	129	297
24	3–16	55.20	2.62	140	324
24	1–4	74.42	3.53	187	432
24	5–16	93.13	4.42	234	540
24	3–8	111.74	5.31	281	648
26	16	19.64	1.03	43	99
26	14	24.57	1.23	54	124
26	12	35.67	1.79	75	174
26	11	39.28	1.97	86	199
26	10	44.21	2.21	97	224
26	8	54.58	2.73	119	274
26	3–16	59.61	2.83	129	299
26	1–4	80.39	3.81	173	399
26	5–16	100.47	4.77	216	498
26	3–8	120.54	5.73	260	594
28	16	21.11	1.11	40	92
28	14	26.41	1.32	50	116
28	12	38.32	1.92	70	162
28	11	42.21	2.11	80	185
28	10	47.52	2.38	90	208
28	8	58.61	2.93	110	254
28	3–16	64.02	3.03	121	278
28	1–4	86.27	4.10	161	370
28	5–16	107.81	5.12	200	463
28	3–8	129.35	6.14	241	555
30	16	22.39	1.19	37	86
30	14	28.24	1.41	47	108
30	12	41.02	2.05	65	151
30	11	45.19	2.26	75	173
30	10	50.76	2.54	84	194
30	8	62.67	3.13	103	237
30	3–16	68.39	3.25	112	259
30	1–4	92.11	4.38	150	346
30	5–16	115 13	5.47	187	432
30	3–8	138.16	6.56	225	518

Prices are subject to discount, according to quantity of pipe ordered. Prices for Flanged Pipe with Pipe Standard or A. S. M. E. Standard Flanges quoted on request; also for Crosses, Ells, Tapers, Tees, Y's, etc.

Above data are based on Double-Riveted Pipe, coated both sides with "Sarco" or "Pioneer" Mineral Rubber Pipe Coating. Net prices vary with price of steel, so quotations must be asked for each piece of work. Size of pipe and thickness of steel depend directly upon conditions under which pipe is to be used. Slip-joints are generally used for heads up to one hundred feet; flanges for greater heads.

RIVETED STEEL PIPE

Standard water pipe in 12 ft. lengths with hub and spigot joints, coated inside and out with coal-tar pitch varnish.

STANDARD THICKNESSES AND WEIGHTS, CLASSES A, B, C, D

Weights are per length to lay 12 feet, including standard sockets; proportionate allowance to be made for any variation.

Nominal Inside Dia. in Inches	Class A. 100 Ft. Head 43 Pounds Pressure			Class B. 200 Ft. Head 86 Pounds Pressure			Class C. 300 Ft. Head 130 Pounds Pressure			Class D. 400 Ft. Head 173 Pounds Pressure		
	Thickness in Inches	Weight Per		Thickness in Inches	Weight Per		Thickness in Inches	Weight Per		Thickness in Inches	Weight Per	
		Foot	Lgth.		Foot	Lgth.		Foot	Lgth.		Foot	Lgth.
4	42	20 0	240	45	21 7	260	48	23 3	280	52	25 0	300
6	44	30 8	370	48	33 3	400	51	35 8	430	.55	38 3	460
8	46	42 9	515	.51	47 5	570	56	52.1	625	60	55 8	670
10	50	57 1	685	57	63 8	765	62	70 8	850	68	76.7	920
12	54	72 5	870	62	82 1	985	.68	91 7	1100	.75	100.0	1200
16	60	108 3	1300	70	125 0	1500	80	143 8	1725	.89	158.3	1900
20	67	150 0	1800	80	175 0	2100	.92	208 3	2500	1 03	229 2	2750

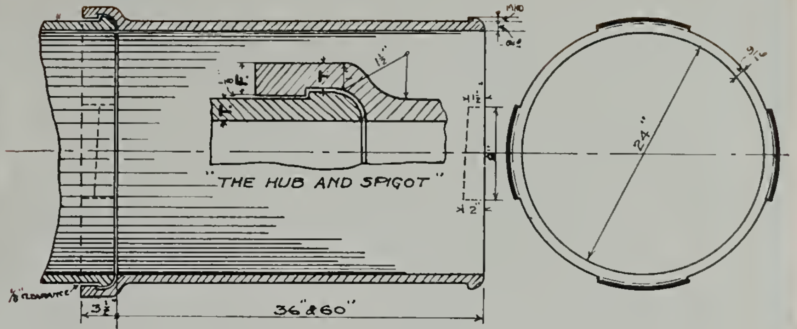
We are also prepared to furnish Bell and Spigot Cast Iron Specials, viz.: Tees, Crosses, Bends, etc., of standard dimensions.

When Ordering, State:

Diameter of pipe.
Head under which it is to operate.
Total length of pipe required.
Nearest railroad point.

AMERICAN WATER WORKS ASSOCIATION STANDARD

CAST IRON PIPE



In the design and manufacture of National Lock Joint Pipe, four prime requisites were recognized and strictly adhered to, viz.: **Permanency**—therefore, cast iron; **low first cost**—therefore, economy of metal per foot; **a continuous tube construction**—therefore, the National Lock Joint which cannot pull apart; **ease in handling and a multiple to get desired length**—therefore, 3, 4 and 5 ft. lengths.

The National Lock Joint consists simply of cast iron wedge-shaped keys cast on spigot and bell ends. By turning the entering pipe 1-8 of a turn, the spigot keys enter behind the keys in throat of the bell and draw the joints closely together. Where flexibility is required, the joints are not drawn up tight; each unit takes its share of a crown or bend in the line and still it is prevented from pulling apart.

This, therefore, is the best pipe for Reservoir Outlets or Culverts—it is also made without the locking wedges for Sewer Pipe.

Sold by the linear foot—not by weight.

TABLE OF DIMENSIONS AND WEIGHTS

Diameter	12"	16"	20"	24"	30"	36"	48"	*48"
Thickness (T)	7-16"	1-2"	1-2"	9-16"	11-16"	13-16"	1"	1 3"
Face of Hub (F)	9-16"	5-8"	5-8"	11-16"	3-4"	7-8"	1 1-4"	1 5"
Weight per ft., lbs. . .	60	90	120	160	220	300	500	750

*Extra Heavy 48" for very deep fills.

Write for further information and complete catalogue.

When Ordering, State:
Diameter of pipe.
Total length required.
Nearest railroad point.

NATIONAL LOCK JOINT

CAST IRON CULVERT PIPE

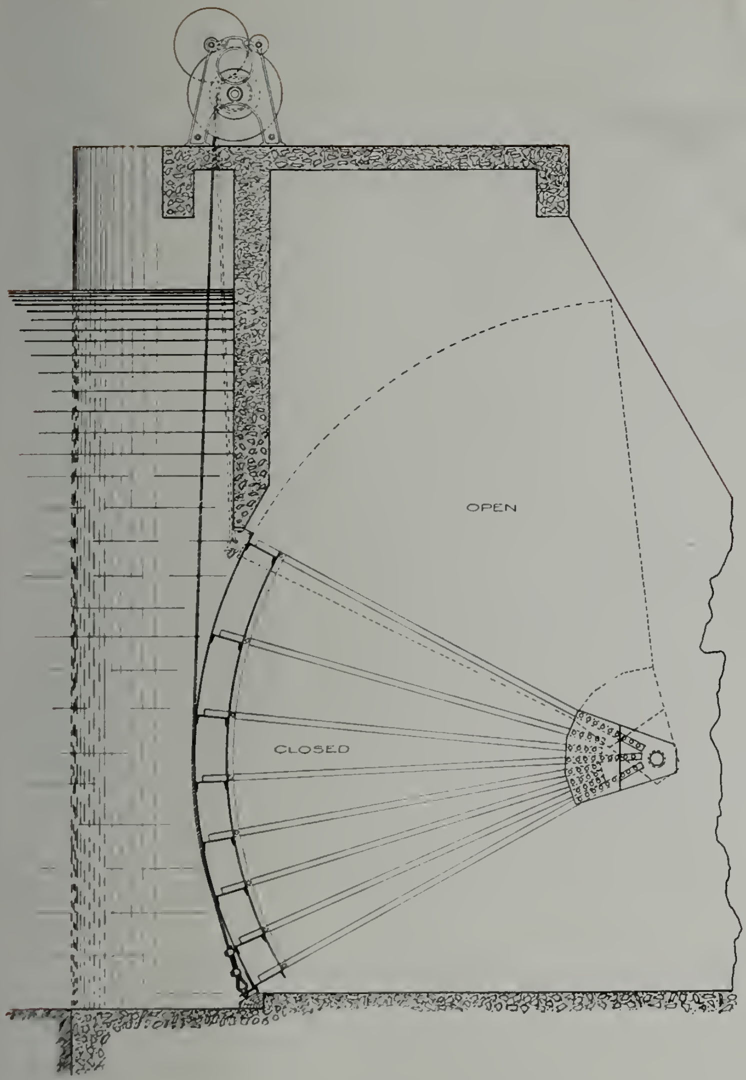
Vitrified Pipe, also called Sewer Pipe or Tile, is used to a great extent for outlets through ditch banks and for conduits through dams for small reservoirs where the dams are not too high. It has a smooth salt glazed surface, making it impermeable; it is easily laid without the use of skilled labor and is durable. It should be used only for very light pressure work.

Inside Diam. Inches	List Prices Per Lin. Ft.	Weight Per Lin. Ft.	Number Lin. Ft. Carload	Thickness of Shell Inches	Depth of Socket Inches	Cementing Space Inches	Length of Pipe Feet
6	$ .30	14	2000	5-8	1½	⅜	2
8	.45	23	1200	3-4	2	⅜	2½
10	.60	31	900	7-8	2	½	2½
12	.75	40	650	1 1-16	2½	½	2½
15	1.00	64	450	1 3-16	2½	⅝	2½
18	1.50	88	300	1 1-2	2¾	⅝	2½
21	2.00	101	270	1 5-8	3	⅝	2½
24	2.50	131	210	1 7-8	3¼	¾	2½
27	3.00	215	130	2 1-8	3½	⅞	2½
30	4.00	256	120	2 1-4	4	1	2½

PRICES ARE SUBJECT TO DISCOUNT

On carloads we quote delivered prices and stand breakage in transit.
On less than carloads we quote prices f. o. b. Denver and do not stand breakage.
See page 9, Fig. 9, for method of attaching Lateral Gates to Vitrified Pipe.

VITRIFIED PIPE



Radial Gates have as their principal function, the control of water at canal intakes, at wasteways or mounted in series, forming movable dams. They can also be used for reservoir outlets and for other purposes, under pressure, where a very small leakage is not objectionable.

In general their design consists of a steel plate bent to a given radius and placed to receive the water pressure on the convex side, transmitting it through horizontal beams to radial arms at each side which converge to a common center or axle on which the gate revolves. This axle does not extend across the opening, but protrudes from each side only enough to give bearing for the gate, so that the opening is clear for the flow of water when the gate is raised.

Power for operation may be supplied in various ways, probably the most common method being such that one man can easily handle a single gate, and the fact that there is almost no friction to overcome, permits this to be accomplished by the use of a simple and inexpensive Lift. The cut shows a Geared Winch for this purpose, and when used in connection with a balancing weight, this small device is capable of operating large gates.

Radial Gates possess several advantages that promote their usefulness. Perhaps the greatest is in the elimination of practically all friction, placing the requirement for lifting mechanism at a minimum and making possible the quick operation of large gates. They are exceedingly economical, in that a large flow area can be controlled at a very small expense; they are classed as permanent construction and because of their simplicity there is nothing to get out of order and nothing to demand heavy maintenance costs. In fact, aside from occasional painting, this last may be neglected entirely.

STANDARD SIZES

In Feet

Width x Height	Width x Height	Width x Height	Width x Height
6 x 5	8 x 5	10 x 5	12 x 6
6 x 6	8 x 6	10 x 6	12 x 8
6 x 8	8 x 8	10 x 8	12 x 10
6 x 10	8 x 10	10 x 10	12 x 12

When Ordering or Requesting Prices, State:

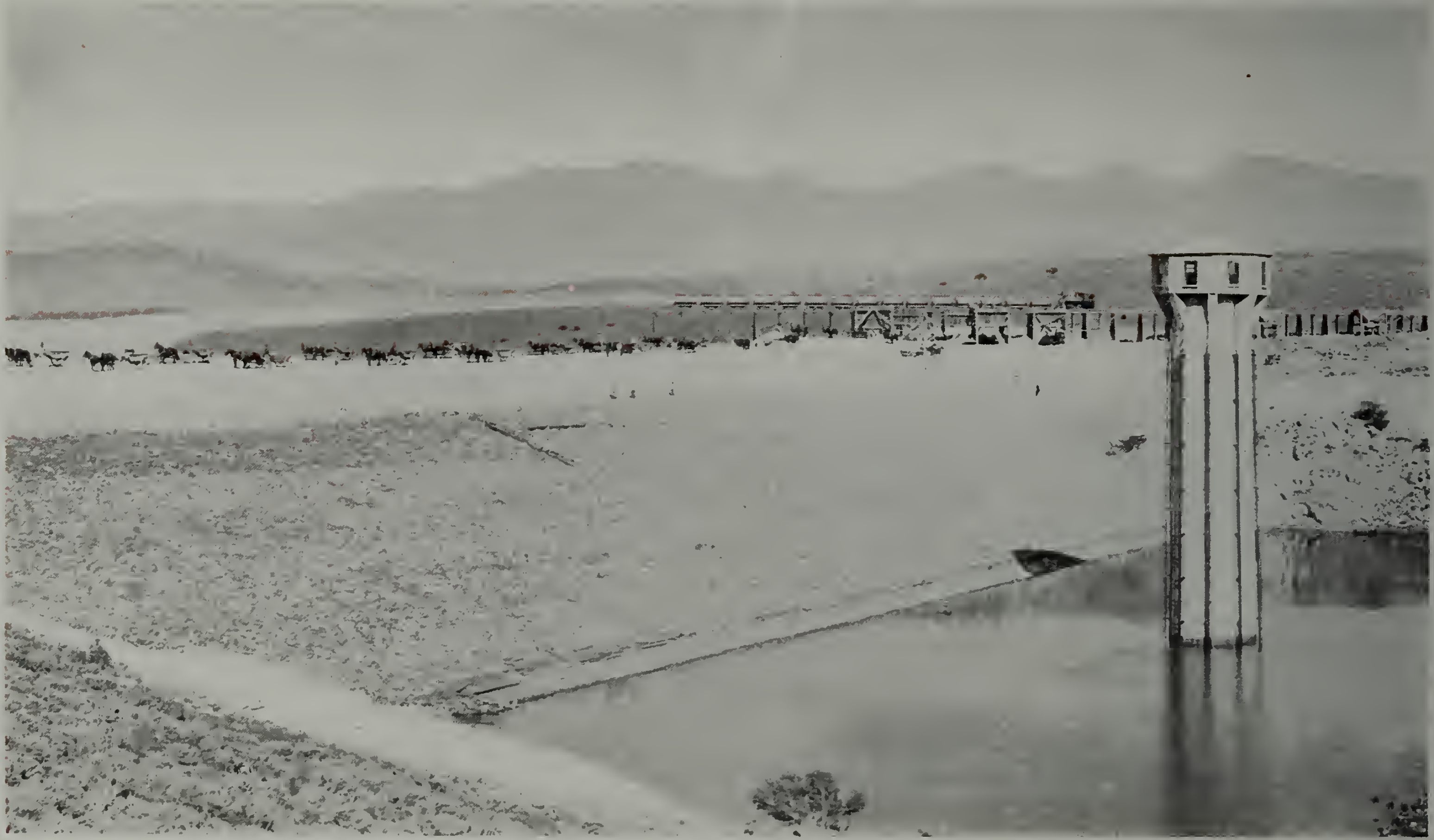
Width and height of opening.

Greatest depth of water against center of gate.

Purpose for which gates are to be used—whether Canal Intake, Wasteway, Moveable Dam or under pressure.

Operating Power—whether by hand, electricity or water.

RADIAL GATES



SANCHEZ RESERVOIR

In the San Luis Valley, Colorado. Owned and operated by The Costilla Estates Development Co. Capacity 104,000 acre feet, or 4,532,320,000 cubic feet. Capacity of Outlet Conduit 750 second feet. Tower 150 feet high, 15 feet inside diameter.

Complete Water Controlling Equipment, consisting of three 48″ Valves, eight 30″ Valves, eight 30″ Sluice Gates, 19 Geared Lifts, Steel Ladders, Platforms, Guards, Screens, etc., furnished by

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